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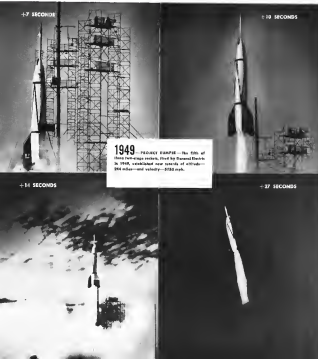
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General Electric's Missile & Ordnance Systems Department, presently is working on an Air Force prize contract to develop the ICBM nose cone. Programs are being carried out in such varied fields as communications, hypersonics, metallurgy, mathematics, and thermodynamics to support this nose cone contract.

TODAY

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MR. ROBERT P. RAYLAND, Flight Test Engineer at MOSSD, directed Project BUMPER and other advanced programs, gaining valuable experience which is currently applying to present missile programs.



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General Electric has formed the Missile & Ordnance Systems Department to act as a Company focal point for large, highly complex missile projects. Scientists in the new department, backed up by the vast resources of many General Electric operating departments and laboratories, are currently working to solve the perplexing problems associated with the ICBM nose cone and other missile projects.

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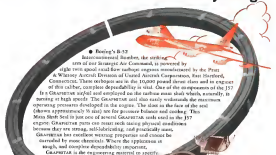
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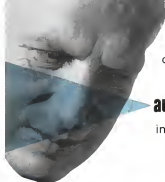
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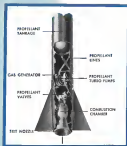
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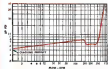
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Eastern Handler Mergers Complicated

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'Easts' Face Better Performance Series

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► Dozens of new compounds can add range and power, reduce fuel weight, engine size

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COVER: Yanks Value (21) shows first of the V-bombers to be supplied to the Royal Air Force; and the British along with Canberra to launch Egyptian attacks. Yanks were based on Malta. Four B-29 Superfortresses launched power the Yanks, which was a crew of 10. The Harvard Superfortresses carried 1000 lbs. of bombs in a second development for tactical use (ATV Aug 30, p. 54).

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EDITORIAL

The Prospect Ahead

Last week's national election produced no change in the political picture guiding our federal aviation policy, but a number of new issues will face the now familiar combination of a Republican executive branch of the government and a Democratic-controlled Congress. These new issues have been spawned by the explosive political situation in the Middle East and Europe and the fantastic speed and scope of small weapons technology.

The prospects of peace and universal disarmament—fittingly termed possible that the summit conference at Geneva was only 16 months ago—have been badly jolted by bomb blasts in Egypt and tank battles in Budapest. These eddies, underscored by the blast Russian note to Britain and France with its threat of atomic missile attack, make it clear that significant superiority in the weapons of atomic age are still an indispensable ingredient of effective foreign policy. The threat of atomic missile attack is the Russian note to Britain and France is the first appearance of the inevitable Soviet use of their growing aerial delivery capability for atomic and hydrogen weapons for political blackmail.

Current Strategy Obsolete

The contrast between the paradoxically slow aerial and amphibious attack mounted by the Anglo-French forces against Syria from Cyprus and the swift destructive capability of an offshore jet hydrogen bomber tipped with atomic or hydrogen warheads is all too obvious. The need of U.S. aerial weapons superiority and the relation of our program in this field to that of the Soviet Union is a burning issue not only domestically but also among our friends and enemies around the world.

Within the Pentagon, the galloping technology of new weapons within development has—as we have often emphasized—made current military organizations, tactics and strategy obsolete. The process of reorganizing our military forces to cope with the full effectiveness of modern weapons technology will be a painful and bitter battle against entrenched tradition and shyness. Management that will inevitably spell out of the Pentagon's concrete corridors into the White House and the Congress.

A race in the Fiscal 1958 defense budget is already conceded to be inevitable. Defense Secretary Charles E. Wilson, slated for replacement as the second term cabinet of President Eisenhower, estimates a 4 to 6% increase is already necessary, but pressure of design costs

reflected in Congress may boost that bill even higher. The aircraft industry will get more defense dollars in Fiscal 1958 regardless of the result of this military policy debate.

Industry has shifted into high production rates on such key weapon systems as the Convair F-102, an all-weather interceptor, the Boeing B-52 strategic bomber, the Lockheed F-104 supersonic day fighter and others. Higher delivery rates will be reflected in higher gross sales on down the list from prime contractors through the tier of subcontractors, component manufacturers and suppliers. Margins of profit to be allowed for the aircraft industry's military business will continue to be a bone of contention between the Pentagon, Congress and the industry.

Increased Soviet use of military force and small weapons superiority, both as a threat and actuality, will place heavier emphasis on the need for an accelerated and expanded U.S. research and development program. Without a research and development program keyed to achieving major scientific breakthroughs in minimum time and maintaining a recognizable qualitative superiority in atomic airpower, it will be difficult for any nation to push an effective foreign policy in the international jungle that looms ahead.

Traffic Control

In cold wartime, the vast economic, technical and political problems of building a modern air traffic control system that will safely handle the enormously increased demands of air transport and air defense will be the major issue for the foreseeable future. During the final year of the first Eisenhower Administration, a good start was made on this problem, both at the operational and long-range planning levels. There should be no reason for not continuing to push this program as hard as possible. Airport modernization and economic health of the air transport system will continue to be issues.

The events of the past few weeks that we saw the peaceful fronts of the world broken by war to attack force should emphasize again, if any such emphasis should be needed, the absolute necessity for a sound research, development, production and operations program for both military and civil aviation. In the kind of a world we face today, a nation without repeat airpower will not last long enough to contemplate or use the other elements of its national strength and character.

—Robert Hote



OK, OK, I'll get the Fafnir man's ideas



The AWAR Series ball bearing is made of alloy steel and is designed with a special heat treatment process to give it a life of 100,000 hours or more of efficient service.

Tackling unusual problems is the application of bearings to aircraft is not unusual for Fafnir Bearing Specialists. That's why Fafnir has such a long list of "fans" in aircraft bearing developments. A recent example is the new AWAR Series of aircraft bearings for supersonic aircraft. These bearings are specifically designed to meet new standards of low friction, minimum back lash, and maximum heat resistance. For complete details write The Fafnir Bearing Company, New Boston, Conn.

FAFNIR AIRCRAFT BEARINGS

FIRST... at the racing point
in aircraft design



WHO'S WHERE

In the Front Office

Lord Kitchley will become chairman of Rolls-Royce Limited, Derby, England upon the retirement of Lord Hives in January. J. D. Ferriss and Whitely Straight will become deputy chairmen. Mr. Perriss will succeed Lord Hives in chief executive of Rolls-Royce and will continue to oversee director of the New Engine Division. F. Lloyd Kelly, board chairman, Lockheed Corp., Chicago, Ill. Thomas A. Kelly succeeds Mr. Kelly as president and chief operating officer.

M. J. Van Der Pong, deputy president and head of traffic and sales director, KLM Royal Dutch Airlines, M. Van Der Pong succeeds P. van Balloek who will retire Dec. 31, but continue as an advisor.

Donald C. Johnson, assistant to the president, Sperry Products, Inc., Danbury, Conn. Mr. Johnson formerly was president and chief engineer of Eldecia Controls, Inc. Robert Engle, executive vice president and director, Ford Sterling, Inc., Pittsburgh, Pa.

John M. Doherty, vice president general manager, Field Sales Division, Calspan & Louis Machine Tool Co., Ford Air Lac, Wis.

R. G. Brown Jr., vice president manager, Rockwell International, Inc., Northridge, Cal. Robert M. Rosen, vice president field operations, C. Hager, Inc., vice president planning and programming, Calspan. A. Skop, vice president flight operations, and Ken E. Woodell, vice president operations, Calspan, Inc., operations, Hughes Aircraft Co., Culver City, Calif.

Honors and Elections

William J. O'Brien and Harry F. Schmitt of Decca Company Ltd. received the Institute of Navigation's Gold Medal for 1959 for their work in negotiating and developing the Decca Navigator system.

Changes

Kate W. Meach, general project manager for a major guided missile project, Pacific Division, Avco Aircraft Corp., North Hollywood, Calif.

J. Ralph Helms, technical assistant to the general manager, Hercules Industries Inc., General Motors Corp., Los Angeles, N. J. Lawrence A. Swartz, vice president, M. Helms as chief engineer.

A. C. Nading, New England regional manager, Boston Mass. J. United Air Lines, Robert G. Downing, company flight training, Ford L. Aches, company flight engineer, and Mrs. Fafnir, company flight instructor, Trans World Airlines, Inc. Mr. Downing succeeds Bernard M. Connor, vice president flight training, General Motors.

R. Fafnir succeeds Gail A. Brock, vice president, as TWA's newly appointed jet planning coordinator.

Ernest D. Stahd, chief flight operations, General Aircraft Corp.'s Lockheed Plant, Azusa, Calif.

INDUSTRY OBSERVER

Continental version of the Pratt & Whitney J57 turbojet engine will replace conventional fuel assemblies instead of the two separate units now used on the engine. This will prevent coking by burning the primary secondary fuel flow and the secondary one inside. Secondary fuel flow in current versions does not come into play until 2,000 lbs. per hour fuel flow is required.

USAF and defense manufacturers are working with Fairchild and General Electric to provide reconfigurability of Fairchild J65 and GE J65 engines for missile and propulsion applications. Another proposed use of these engines is as auxiliary aircraft. Fairchild's J65 is expected to be coming on a test stand before the end of the year. Later models are expected to have thrust-weight ratios of better than eight to one. GE's J65 is already running on a test stand.

Eighty seven Army missiles have been submitted to the Pentagon from all parts of the world for a three-day conference Tuesday, Wednesday and Thursday. Called by Maj. Gen. Randolph H. House, chief of Army armaments, the meeting is designed to bring the personnel up-to-date on Army plans and to discuss future programs.

Lock Aircraft's Engineering Division, Santa Monica, Calif., is reportedly interested in developing a Napier Fluid turbine power package for use by General-Lux operations. A General 340 powered by the Napier Fluid already is flying in England (AW Oct. 5, p. 40).

Third aircraft production agreement being negotiated between the U. S. and Japan calls for 138 F-86's and 38 T-33's for the period July 1955 to June 1959. This will bring the total of Japanese-controlled as produced jet fighters and trainers to 308 F-86's and 210 T-33's. Japan's Air Self Defense Forces hopes to reach an agreement by the end of the year for production of a Century series fighter to follow the Silver. Provisions for production of such an aircraft in Japan are expected to take 30 months.

Purolite Aircraft Corp. is considering the purchase of the Balkans Aircraft plant in New Castle, Del.

Reed Aircraft Corp., Milwaukee, Wis., has a backlog of four orders for its new, supercharged version of the Gulf 100 engine currently in production. Reed Aircraft Corp. 100 is priced at \$10,325. Delivery schedule of two per month is planned after January.

NC-6 and NC-7, two new light fighters developed by Sperry's Hughes-Avionics S. A. and Coastwestcoast Avionics S. A. (AW Oct. 5, p. 23) will be powered by the Bristol Ophion turbojet engine. An afterburner will be included in later models. Proposed investment for the development of the NC-6 includes two 10 mm. Hughes cannon. The attack version will carry four 25 mm. Hughes guns and rockets.

General is developing a trainer version of the F-106, indigenous model of the F-102. The Air Force, which has awarded General a contract for development of the trainer, feels the new version of the F-102, a side-by-side trainer, requires performance to such an extent that it cannot double as an operational fighter. Designation of the trainer version will be F-106B.

In the past three years, U. S. Army has broken away substantially from dependence upon USAF maintenance facilities. It now issues more than half of its own required headbooks and hopes eventually to eliminate all dependence upon the Air Force in this regard.

Avco has awarded a \$12 million contract for support equipment for Republic F-105's stationed in Europe. Equipment will be supplied by Republic Aviation International S. A., Laguna, Switzerland.



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The Fairchild C-123 Twin-engine, trouble shooter, production expert and top flight maintenance man—watches over the career of every Fairchild engine assigned to the U. S. Air Force.

He's all in to help keep the C-123 flying in top operating condition all the time...he spends extra flying hours out of every week. He has to be able to anticipate problems, answer any questions about powerplants, propellers, landing gear, electrical systems and details of other C-123 components—and be able to explain or maintain any of them. He's thoroughly experienced in how the plane was

built, how it should fly...and how to keep it flying. His work hands in hand with Air Force flight engineers, crew chiefs and maintenance men.

He's the Fairchild C-123 maintenance and flight expert...his presence at bases all over the world gives the United States Air Force the greatest possible utility from Fairchild-built aircraft in squadron service.

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Washington Roundup

'Outside Security Realm'

Consensus of speeches prepared by top Army, Navy and Air Force officials—both civilian and military—will be a major issue before the House Government Information Subcommittee this week.

Lined to campaign first Robert Topp Reno, Assistant Secretary of Defense for Legislative and Public Affairs, and his staff are remodeling their review of speeches to Navy Under Secretary Thomas S. Gates Jr. Both men are administration appointees, but Gates—like Army Secretary William Bradford Huie and USAF Secretary Donald A. Quarles—has found that their office works a heavy load period (AW Oct. 19, p. 15).

In a continued uncertainty which Pentagon sources so referred into a small degree of his angle, Gates told top Navy officials that some of the changes Reno's office made in two of his speeches "appeared to be outside the realm of security and did not appear to rise to be in appropriate to policies Defense Department policy."

"I did not know whether to take them as suggestions or as directives," Gates' memo said.

Gates noted that Reno's office sent speeches to the State Department, the Atomic Energy Commission and other agencies for advice "before appropriate" and "in accordance," he (Reno) has requested comments from the Secretary of Defense and Adm. Hallford. He added:

"It is noted that all comments made on our drafts were mostly in the form of suggestions except those dealing with security, and he agreed that all security questions would be closely scrutinized as such."

The subcommittee, headed by Rep. John Mica (D-Calif.), will go into a number of other issues involving Defense Department activity and administration policies.

One will be memorandum made by Ensign Scott J. Clifton E. Wilson last summer in service research and development reports on whether and how information in their field should be disseminated. The memorandum has never been made public.

F-84s in Egypt

Although apparently unknown to Pentagon officials, France has been using American-built aircraft in the Middle East since the French air force had three squadrons of Republic F-84 Thunderbolts in the Moroccan sector. Reason for using the F-84s was that the French Mirage 3 is an interceptor, not a fighter-bomber, and lacks the range to permit sufficient time over targets.

The French also were reported using Republic Thunderbolts for reconnaissance. British pilots were flying Hunter fighters and Canberra bombers, also committed previously to NATO missions.

'Cold Atoms'

USAF's Office of Scientific Research will seek comment from leading nuclear physicists on a "cold atom" fusion which, if correct, might lead to superenergy bombs and space flight at velocities faster than that of light.

The Office of Scientific Research has not yet agreed to test the theory experimentally, but it has had enough interested comment from scientists convinced thus far to feel that further examination of the idea is warranted.

The claim, challenges two scientific concepts—that 4095 F is absolute zero, and, second, that the velocity

of light (186,300 miles per second) can be exceeded. Author of the theory is Dr. Robert L. Carroll, 40, former chairman of the Department of Physics at Fairmont State College, Fairmont, W. Va., who has been dean of students in the pilot training division of Naval Air Test Center, Philadelphia, Md., since early summer.

If the theory is correct, no atom would become less active as it grew cooler. Its electrons would gravitate toward the nucleus, and this gravitation would have them to move faster and faster. Making the atom cold enough, Dr. Carroll believes, would plunge the electron into the nucleus and disintegrate it, releasing the entire energy of the nucleus.

Flight Scholarships?

The Civil Air Patrol will ask the 95th Congress for a program which will teach 2,000 cadets to fly in its second year, work up gradually to 10,000 pilots a year. The Air Force is supporting the program, and some legislators already have been awarded out. CAP did extensive research, talked to flight schools, cadets, parents and members in formulating its plan. The program was delayed in 1955 so it would not conflict with the Air Force ROTC legislation, and the CAP has had ample time for planning.

CAP has flight scholarship idea to its education that general aviation, and aviation and military aviation are all necessary to support aerospace, and recognition that there is no government-supported training program now.

'The Airman'

Beginning next April 8, the Air Force will publish a new aviation journal designed to keep its personnel informed on the issues, training problems and legislation that affect their jobs. The first USAF aviation publication since the World War II "Air Force" was taken over by the Air Force Association, the magazine will be distributed free of charge, with one copy for each ten personnel. Put out in the Internal Information Division, Office of Information Services and Research "The Airman," it will be available through the Superintendent of Documents.

Bloodless Revolution

The pattern of supplemental air carrier association may be in for a change as the result of a sudden switch in the management of the Air Corps Transport Area. A division group headed by Asst. Henshaw and supported by U. S. Overseas Airlines, the Trans American Airlines, carriers and other ACTA members has taken control of the organization by simply appearing in the Washington office and announcing they were taking over.

The surprise coup has caused widespread worry among ACTA's members, and it could result in their forming a new organization or joining ACTA's real, the Independent Airline Air Transport Area.

ACTA's regional council after a period of quiet when it appeared that the airlines had settled down as a coherent group under the leadership of President A. J. Rosen. Now Rosen has resigned, along with five of ACTA's seven directors.

Apparently the split is not over, and the support of Trans American goes the disunity enough strength to this over.

—Washington Staff



B-105 (66-6663) takes test of barrier. Flying side-on view shows cable has given test strength to limit impact (photo showing rear view). As the airplane draws the cable, pilot notices it to just one shock, allowing cable to drag 400 ft. without shock.

Runway Barriers Planned for Bombers

Impressed by gear's effectiveness in saving jet fighters, USAF plans barriers for B-57, B-47.

By Everett Clark

An Air Force plan to extend the use of runway barriers to modern and heavy bombers belonging to the Strategic Air Command.

It also is developing a stronger bar for its large, heavy fighter aircraft in which ground barriers cannot meet.

Development of barriers for larger aircraft is an outgrowth of the success full use of 180 chain-type barriers at Air Force bases throughout the world. The Air Research and Development Command issued statement last week that the barriers meet USAF SFA criteria in a 11-month ground testing here.

Via Zelle Associates, Inc., of Balti-



WEIGHT of engine chain, raised by dragging cable, stops the B-105. Testing was conducted by Air Research and Development Command at Wright Air Development Center.

more, Md., has a contract for design, prototype manufacture and testing of the barrier barriers. Testing will be carried out by USAF at Edwards Air Force under contractor supervision. Target date for completion of testing is December of 1957.

Mid-1957 Test

All-American Engineering Co. of Wilmington, Del., is developing the system for heavy fighters.

The system is due to be tested by mid-1957.

Both developments are being supervised by the Captaining and Testing Section of the Equipment Laboratory at Wright Air Development Center. Section chief is Capt. John T. Stone, who helped develop the 180 chain-type barrier at the Fairchild Air Force engineering depot after that aircraft in Korea and Japan caused an excessive number of crashes.

The barriers feature motor roll-up chain from the runway. A cable will drag a hook along a 1,000-ft. leading surface which pulls the runway. The surface cables will be similar to that used in auto and aircraft wheel brake traps.

Breaking Force

Breaking force of the barrier system is expected to be 113,000 lb. Peak loading force for the chain barrier is around 110,000 lb., and that concept is maintained.

The chain-type barrier is activated when the rear wheel of the landing aircraft engages a roller bearing stretched three feet high near the end of a runway. Nylon ribbons running vertically to a steel cable flip the cable up and over the aircraft's main wheels.

As the roller rolls forward, two pins stretching the cable to two points are thrust all allowing the cable to drag 400 ft. of ship's main chain. The chain, stretched along each side of the runway, weighs 130,000 lb.

Since the first barrier was installed in Japan in March 1951, barriers have been used to stop T-33s, F-80s, F-86s, modified F-86s and F-100s with out external tanks. F-86s with tanks also have been stopped.

Tests with Convair F-102s have indicated that current chain barriers will not be adequate for heavy fighters and interceptors with their much higher landing speeds.

Why Failures Occur

An ARDC study of 15 months of operation showed that the 100 USAF barriers were used 527 times. In 185 cases the barriers functioned perfectly and the damage was confined to the aircraft's nosegear.

The study also showed:

- In 89% of the cases, failure was due to pilot error. For example, leaving a gear brake down can deflect the cable so that it does not engage its nose landing gear.

- In 81% of the cases, the aircraft engaged the barrier at a speed too slow to arrest a barrier, and some minor damage resulted.

- In 12%, failure of the barrier was due to mechanical or maintenance problems.

- In 11% of the total, causes were not sufficiently explained to determine the cause.

Bomber Costs

ARDC indicated that repair costs to the 735 aircraft at \$1,200 each (\$600 for labor and \$600 for parts), or a total of \$246,000 is compared with the \$82 million it would have cost to replace the planes.

Current barriers dissipating major aircrafts under the first one, are installed at a cost of \$18,000 each and have paid for themselves in only 15 days, ARDC estimated.

Until recently chain barriers were manufactured by the Avco Precision Products Co. of Danbury, Conn. ARDC arrangements for a new production contract produced two bidders, Avco and the Saco Manufacturing Co., of Windsor, N.J., a division of the Ford Motor Co. Saco's Michael Todd Co.

Mr. Stone is a brother of Capt. Stone, who helped to develop the runway barrier system.

ARDC Establishes New Agency To Counsel Small Businesses

Washington—Air Force's Air Research and Development Command has established a new agency to provide a one-stop counseling service for small business.

The agency, designated the Executive for Small Business, is located in the Directorate of Procurement at ARDC Headquarters in Baltimore, Md. It is headed by John C. Fisher, former assistant administrator in the Office of the Director for Research and Development, Headquarters, USAF.

One small business specialist will be designated in the procurement directorate at each of 11 ARDC centers and at ARDC Field Development Offices in New York, Los Angeles, and St. Louis.

ARDC hopes eventually to have a specialist in Chicago, where there is no field office now.

ARDC defines a small business as one which is not dominant in its field and which—taken together with its affiliates—employs fewer than 500 persons. It also will accept as a small business an firm designated by the Small Business Administration.

Change in Attitude

The Small Business Council held at "Workshops" the Air Force is making a special program to stimulate small business participation in research and development work, and recommends that the Army and Navy also place special emphasis on this particular type of small business activity.

In fiscal 1958, the committee said, only 3.7% of USAF's research and development business went to small firms compared with 9.4% for Army and 9.9% for Navy.

In previous December before the committee, Assistant Secretary of the Air Force for Michael Douglas C. Stone classified research and development in the type of government procurement in which small business was not qualified to participate.

The report, and the committee, headed by Sen. John Sparkman (D-Mo.), has long felt that research and development should be a fertile field for small business. It is in the largest of the steps taken by the Air Research and Development Command will bring about a substantial increase in the number of contracts going to small firms.

It added: "Tameless one-sided a defensive attitude. . . . They seemed much more concerned with maintaining a status quo."

No "Paper Program"

The percentage of prime contract business available to small firms that actually went to small firms steadily dropped from a high of 7.0% in fiscal 1951 to approximately 6.5% in the 1953 fiscal year.

On recommending the committee noted that "present plans are somewhat meager in qualified small firms, but no program exists as administratively. Major prime contractor should be directed periodically to present the subcontracting agencies from becoming inactive in this type of activity."

While the military departments and other agencies formerly spoke "directly and constructively" of the Small Business Administration, the committee pointed out that this attitude has changed, and that there is now close liaison and cooperation with the small business agency.

Cooperation from Contractors

Despite the encouraging report that Air Force recently has presented to the military services, the committee cautioned:

"There is no reason for complacency, since there is presently greater competition for military contracts than ever before. Large firms are actively seeking contracts which were once shared by the numerous contractors of small business. Thus, there is a greater urgency for efforts a small business program, since it is universally recognized that these small firms are not only essential to the economic expansion of the military, but they are also indispensable in case of any future mobilization emergency."

Boeing Takes Option For Bomber Plant

Seattle—Wash.—Boeing Aircraft Co. has taken an option to buy the Ford Motor Co. plant at Richmond, Calif., as a possible site for the manufacture of the Boeing long-range ground-to-air interceptors.

William M. Allen, Boeing president, noted the option was purchased after an inspection of a number of possible sites for a bomb factory.

Allen said, however, no decision has been made whether to purchase the Richmond plant.

Boring a developing Boeing for the Air Force.



HO4S-60 helicopter powered by Ecopoint T53 engine has begun flight tests at Ft. Worth, Tex. (See page 30).



HO4S-60 jet helicopters are lined up at Hill Air Force Base, Calif., for delivery to Army at Ft. Rucker, Ala. The two powerplants of two-place, two-blade single main rotor helicopter develop 68.5 thrust each, weigh 12 lb. each. Air frame is welded tube with Douglas cloth tail boom structure, fiberglass cowling and landing, and plastic forward windshield.



HO4S-1W rotor helicopter carries ANFMS-2RE search radar in bubble nose, will detect low flying enemy aircraft.

Helicopters: Two Start Tests, Latest HR2S



LATEST modification to the two-engine, five-bladed Sikorsky HR2S helicopter makes it an anti-submarine rotor platform for Navy. Intended to detect low flying enemy aircraft, the helicopter could be carried on an escort carrier or other ship and kept up to extend the aerial radar coverage of shipboard units.

HR2S has changed considerably since prototype first flew (center). Design changes include dual rotors on all landing gear legs, dual engine exhausts, large air-cooling grille on auxiliary subengine intake pipes, redesigned tail boom with relocated large base, relocated and redesigned horizontal tail, new air controls.

Down lift and roll is now differential during takeoffs (top and bottom photos) were necessary because of increase in size of rotor diameter from 65 to 72 ft and are not exclusively a rotor helicopter modification.

Air Force Plans Budget Increase For Contract Technical Services

Washington—USAF's budget estimate for Contract Technical Services in Fiscal 1976 will run at about \$111 million.

The figure, up about 24% from the \$90 million set in Fiscal 1975, reflects the Air Force's continued shortage of skilled personnel to keep modern, complex weapon systems in combat condition.

Fast recapitulation of new aircraft—such as the Century-series fighters and the B-57 intercontinental bomber—than electronic equipment and the low replacement rate of Air Force technicians have increased with USAF's growing need to make new opportunities for its duty experts.

With the advent of more complex weapons, including guided missiles, and the expansion of aircraft control and warning facilities, the trend can be expected to continue.

Now almost nine years old, the Contract Technical Services program was authorized last May with the assurance of Air Force Regulation 66-35. Worldwide supervision of the program was turned over to the Directorate of Manpower Engineering, Headquarters, USAF.

What Contractor Provides

Cost of the service from Fiscal 1958 through 1975 has climbed from \$6 million to \$90 million. The \$100-million total is equivalent to the cost of 492 F-106 fighters at \$740,000 each, or 152 B-47 medium jet bombers at \$2,400,000 each.

Currently, the Air Force has 136 contractors working on the program, with representatives scattered all over the world. One of the major management projects of CTC is the Air Defense Command and Warning system of the Air Defense Command. The work is divided between Philco and the Radio Corporation of America.

The contractor provides live men at each site, covered under annual commitments to be 30 to 110 Air Force personnel.

In addition to its own experts, the contractor provides advice, consultation and direct experts to work side-by-side with USAF technicians.

Under the CTC program, the contractor does not conduct his internal operations of his own company. He is hired to help the Air Force keep the system in operation, regardless of who made the component.

At the present time, this procedure does not apply to weapon systems, but USAF believes the evolution of CTC

eventually will lead to a program placing responsibility in the field to the prime contractor, under a special CTC contract. Until then, weapon systems will be provided for service in destination by the component action.

Types of Personnel

Here it is important to show USAF's distinction between the type of personnel provided under the CTC program.

- **Technical representative** is an employee representing a manufacturer of USAF equipment. He is under contract to the manufacturer but assigned to USAF for duty.

- **Contract technician** is an employee representing a commercial firm (such as IBM or RCA) under contract to the contract manager assigned to USAF for duty.

- **Field service representative** is an agent of a manufacturer or commercial vendor who provides company administration, or, in some cases, liaison with the customer or other parts of the company's product.

USAF spokesmen also emphasize that the CTC program should not be confused with contract liaison work, which provides a complete package based upon a work specification.

This is applied mostly in the USAF program and does not involve technical work or RCA under contract.

Effective at the beginning of Fiscal 1975, the Air Force put all contract technical services under a separate service contract. Previously, the services were provided by the manufacturer at the Air Force's or the production contract, which included a fee for the service.

Australians Critical of Woomera

Melbourne—Australian government officials have admitted privately that the results attained with missiles at the Woomera missile testing range have not justified large overhead expenses.

Australia is a partner in American research work on missiles, and has spent as its contribution more than \$100 million, a large sum considering the population of Australia is 5.5 million. An annual defense budget is rising in Australia, and pressure is developing to force the government to revise its agreement with the British Ministry of Supply.

Australian defense experts are wondering whether Australia ought not to associate itself with the U.S. missile program, which Australian considers as a more advanced stage in its practical involvement with the British work.

Annual missile is being constructed

against an overhead or a percentage of the cost.

The shift away from this plan actually began in 1950 when the USAF started its post World War II shift of new equipment and found its skill levels spread thin.

In the years since, the need for Contract Technical Services has grown steadily as more and more complex equipment has been introduced and the rate of turnover of military maintenance personnel has lowered USAF's skill level.

Under the terms of AFM 66-11, each major contract must have a central office to control the CTC program. The contract must budget and provide funds for all of the service required on its equipment.

The amount of detail required from each contractor in submitting its CTC requirements has been substantially increased. This forces a careful survey to justify the requirements and provides both the contractor and headquarters with statistics on what is needed.

Air Force Six YH-40 Helicopters

Fort Worth, Texas—U.S. Army has ordered six YH-40 helicopter prototypes from Bell Aircraft Corp. for field service testing. Several additional prototypes will be ordered when the aircraft are delivered.

The new model is in addition to three experimental XH-40 models, the first of which had its initial flight last week. See p. 25.

Production versions of the new helicopter will be used by the Army for observation and utility missions. The aircraft will have a cruising speed of 100 knots and a maximum speed of about 1,200 ft. The YH-40 is powered by a Lycoming T55 engine.

at Woomera, some Australian ministers, said to him that he had not yet achieved what he had set out to do. According to the Australian Minister, the results of the tests at Woomera have not justified the large overhead expenses. The large distance between Woomera and England increases the cost of the service is even, they had to be transported back to a field of service is being used for this purpose.

It is understood that the degree of cooperation between the various British aviation manufacturers as well as the basic equipment manufacturers and others involved at Woomera is highly satisfactory.



Rocket Assist for Blackburn Beverley

Jet-thrust each of four Rank rockets (left) caused on each side of Blackburn Beverley profile and addition of 25,000 lb. Thrust rocket achieves a maximum peak thrust of 5,000 lb, and then continues at 1,500 lb for full takeoff. Flight time is as much as 100 sec. at an angle of sight of 15 to 18 deg., including 40,000 ft. peak. Beverley with rockets can take off or land in a 400 ft. by 400 ft. strip. Initial track indicated size of test and simulated modifications.

Nine-Month Aircraft Earnings Reports Generally Show Rises

New York—Aircraft industry sales and earnings for the first nine months of 1955 showed general gains, with some individual companies setting all-time highs. Some companies, however, reported sales had increased, but earnings had fallen.

Curtis-Wright Corp. reported a net profit of nearly \$10 million for the nine-month period, an increase of about \$7 million from 1954. The profit equalled a profit in Curtis-Wright 1955.

Consolidated net sales of General Dynamics Corp. for the nine months were higher than all of 1954 and sales and earnings were higher than any can be made in the same period last year. The company and its subsidiaries reported a net profit of \$15.7 million, 14% higher than a year ago, but sales and earnings were down.

Raytheon's earnings were down from last year, \$21,785,742 compared with \$24,976,449 in 1954, but this was due to the effect of the steel strike, a difficult price situation in equipment, materials, contracts, reduced labor productivity and a big in the new equipment orders. The company had sales of aircraft equipment increased.

Nine months financial reports are shown.

Lockheed Aircraft Corp. sales of \$114

million were 2.2% below last year, and earnings of \$10 million in \$4.95 a share were lower than the \$11 million and \$1.73 a share figures reported for the same 1955 period. Development costs for the Electric turbine caused the lowest earnings.

General Dynamics, sales totaled \$992 million compared with \$956 million for the same period last year. Net income of \$21 million in \$4.13 a share included a net operating profit of \$2 million from the sale of the Starnberg California Broadcasting Corp. Net last year was \$23 million or \$2.49 a share.

Curtis-Wright Corp. announced net profit of \$10,012,361 compared with \$8,431,515 for the same period last year. The company and its subsidiaries reported a net profit of \$15.7 million, 14% higher than a year ago, but sales and earnings were down.

Raytheon's earnings were down from last year, \$21,785,742 compared with \$24,976,449 in 1954, but this was due to the effect of the steel strike, a difficult price situation in equipment, materials, contracts, reduced labor productivity and a big in the new equipment orders. The company had sales of aircraft equipment increased.

Nine months financial reports are shown.

Lockheed Aircraft Corp. sales of \$114

- **Fifth Sterling** reported sales 50% above the first nine months of 1955. Net income was \$567,736 compared with \$191,545, 85%.

- **Associated Spring Corp.** earned \$2,141,000 for the nine months, a gain of 10% over last year's \$2,344,288.

- **Bosch Aviation Co.** announced a quarterly net profit of \$75 per share for the nine-month period ending Sept. 30 over \$67.625, 80% increase of \$83,917,000 over the same period last year. Net earnings were \$2,577,400 as compared with \$2,033,900 for the first nine months of 1955. Total backlog as of Sept. 30 was \$2,232,000.

- **Air Reduction Company**, Inc., net income of \$11,508,435 for the first nine months was higher than the entire year of \$11,557,297 net for the same period last year. Sales at the three-quarter mark were \$175,746,971 compared with the same month sales of \$169,534,996 in 1955. Quarterly dividend was \$5.00 per share.

- **Chance Vought Aircraft** Inc. had a net income of \$1,994,335 in sales of \$77,147,515 for the first nine months. Backlog is \$499,400,000.

- **General Controls Co.** reported nine months sales of \$240,414.61 as compared with \$194,445.18 in the same period last year. Net income was \$1,311,477, down from last year's \$1,156,664. However, company officials expect fourth quarter income to push the 1955 total above the all-time high of 1955.

- **Kennecott Corp.**, aluminum fabricator, had a sharp increase in third-quarter earnings which brought net income up

to \$927,895 for the first nine months of 1978. Over the same period last year, earnings were \$1,462,746.

• **Bell Aircraft Corp.** reported a slight increase in sales and a slight decrease in net income for the nine-month period. Sales were \$136,197,799 compared with \$154,902,483 for the same period in 1977. Net income was \$4,499,053 with income in the same period last year amounting to \$4,747,714. Per share earnings for the first nine months of 1978 were \$1.71 compared to \$1.75 per share earnings for the three quarters of 1977. Backlog of unfilled orders at Sept. 29 was \$775,000,900 compared to \$241,080,000 for the 14c period of last year.

- **Boeing** announced Co. declared a quarterly dividend of 10 cents per share plus an extra dividend of 10 cents per share on common capital stock.
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Oct. 26 to stockholders of record Oct. 16.

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Processing Begins on Data for Curtis Study

Washington—Data comprising the largest and most comprehensive survey of business, private and agricultural aircraft activities yet made, is being processed for presentation late next month to Edward P. Curtis, President Eisenhower's special assistant for aviation facilities planning.

The information was collected during a 45-hour survey of general aviation flying conducted at 900 selected commercial and municipal airports throughout the

U.S. by approximately 3,000 volunteers. About 340,000 questionnaires were distributed by the General Aviation Facilities Planning Group, comprising the leading organizations representing private, business and agricultural pilots and operators.

More than 100,000 questionnaires have been returned and are being tabulated and analyzed by data processing facilities.

The survey, directed by Ross, Allen & Hamilton, a research firm retained by GAFPG, is designed to aid Mr. Curtis in devising future facilities required by general aviation. The study gives companies all activities not involving safety or the military services. The survey received 15% of the nation's 4,800 airports and is expected to provide the most up-to-date and most accurate information available relating to private, business and agricultural flying. Industry and government planners have often cited the lack of such data as having a serious handicap in determining general aviation's true role in the civil aviation picture.



Fouga Magister Trainer in Production

Fouga CM 1708 Magister jet trainers are in production at Air France factories at Blagnac, France. Of the 125 airplanes of this type to be built, 101 are for French use. Experimental version the CM 171 and 172 will be powered by the Turbomeca Garbol turbojet, which has 3,000 lb. thrust. First experimental prototype will make its maiden flight soon. It is destined for high altitude testing of this airport, which has reached 51,600 ft. with altitude in a Caribou test bed.



RB-66 Refueling

Douglas F-6B bomber, RB 66B and RB 66C reconnaissance versions have refueling capabilities built in. Probe and drogue method is used for example of empty extension wing refueling. F-66 released 375 in. out of 14,000 in. flight from Long Beach, Calif., to Hawaii. 3-66 aircraft shown in 600-700 mph class designed to operate up to 45,000 ft. altitude.

CAB Blames Stall In Executive Crash

Washington—A law already still craved the first crash of an executive (Laidlaw PV) on Long Island last January, according to the Civil Aeronautics Board.

The PV-1 crashed eight months after taking off from MacArthur Field on a flight in which a new pilot was to be checked out by the Seattle Aircraft Corp., which owned the aircraft. Seattle is a subsidiary of Gates Service Co. Co., and the three pilots in the aircraft were employees of the company.

After taking off the aircraft was seen near Seafield, Long Island, N.Y., at an altitude of 2,500-3,000 ft. The PV-1 was the PV-1 dip down and fell up then fell off to the left, make two or three turns of a descending spiral and crash about three miles west of Seafield. All three pilots were killed.

The CAB found that the pilot at controls left the aircraft stall while practicing "formation" maneuvers and that the stall occurred at an altitude too low to permit recovery.

San Francisco Wins Airport Fee Fight

San Francisco—San Francisco International Airport has won its long fight to get airport fees high enough to meet costs of operating the airfield. Nine airlines have agreed to accept

basic new contracts which would call for higher fees and for the first time-world permit adjustment of the fees to meet rising costs. They also agreed to higher insurance fees until the contracts are voided out.

The fees cover use of the field and the terminal. The volunteer settlement only a little more from which the city took in the U.S. Supreme Court. The city attempted unsuccessfully, through the courts, to modify the 20-year lease it signed in the 1940s with Trans World Airlines.

The lease, and one with United, called for low fees which no longer were commensurate with the various facilities

used by the airlines, the airport considered.

Agreement to negotiate new contracts came from TWA, United Airlines, Flying Tiger, Pan American, Queen, Silk, Southwest and Western. Three lines want the airport held back—California Central Pacific South west and Japan—but the airport does not expect them to hold out.

The volume was, then, capitalized at this time because attention is focused on the proposed airport facilities that will be added of a \$25 million bond was, in approach—improvements which the city, and would when the gap has been what the airlines get and what the city pay for it.

How New Congress Will Look In Wake of Last Week's Election

Washington—Last week's congressional elections will bring big changes in the civil and military aviation leadership as Capitol Hill. Two notable exceptions.

- **Sen. James Buckley (R-N.Y.)**, a top defender of the Eisenhower administration's taxpayer program was defeated. Delf has been a senior member of the Armed Services Committee and the Appropriations Committee. Replaced by Sen. Strom Thurmond (D-S.C.). His defeat probably will weaken his role in the drafting of the administration's report late this fall. Extensive hearings were held last summer, but the report was postponed until after the election in a move to make it more political.

- **Rep. Don Sten (R-Mich.)**, ranking Republican on the House Armed Services Committee and a veteran of 14 years in Congress, apparently was defeated by a young Democrat, Charles H. Brown. Sten has given strong support to both USIA's strategic air program and the Navy's carrier program.

- **Sen. Warren Magnuson (D-Wash.)**, chairman of the Senate Commerce Committee, was reelected by a sweeping majority. He sponsored Jumbo Airlines, a member of the Civil Aeronautics Board.
- **Rep. William C. Cramer, a senior** and one of the Civil Aeronautics Board. Cramer was defeated in his run on the

Republican ticket for the seat of Southern California's 24th District in Democratic Judge D. S. Brand, an American-born Hindu. The seat has been held by a Republican, Rep. John Phillips, for 14 years.

Committee Picture

This is the picture for congressional committee on civil and military aviation next year.

Senate Commerce Committee. In addition to Magnuson, the four other Democrats up for reelection were A. S. Mike Monroney (Okla.), chairman of the Senate Subcommittee on Transportation (T-1), Sen. Sam Ervin (N.C.) and Sen. Allen Bible (Neb.), protégé of the late Sen. Pat McCarran who co-authored the 1951 Civil Aeronautics Act. The only change in the Democratic side will be Sen. Frank Church (Idaho) whose election in Texas governor leaves a vacancy.

On the Republican side, Sen. John Marshall Butler (Ind.) was reelected, but Sen. Duff's defeat leaves a vacancy. **Senate Armed Services Committee.** The defeat of Duff and Sen. Herman Wilkey (Ind.) leaves two vacancies for new members in the Republican side. On the Democratic side, the only vacancy up for reelection—Sen. Ervin, a member of the Senate Subcommittees on Airpower—was victorious.

House Commerce Committee. There will be five changes in the leadership next year, three of them caused by the deaths of Reps. Peter Freese (D-Tenn.), William Greenback (D-Pa.) and Carl Hootches (D-Calif.). In addition, Rep. Arthur K. Hays (D-N.Y.) and Rep. James Deliver (R-Ia.) have been reelected.

Rep. Clay Hurre (D Ark.) will step into the chairmanship. Rep. John Bell Williams (Miss.) and Rep. Peter Mitchell (Ill.) Other top Democrats on the Committee, were reelected. Rep. Charles W. Wilson (N.Y.), leading Republican member, and three other top Republicans, Rep. Joseph C. (Ellen) O'Brien, Rep. Robert Hale (Okla.), and Rep. John Hootches (Miss.), were reelected.

House Armed Services. The entire top Democratic leadership was reelected, including Rep. Carl Albert (Ga.), chairman Rep. Owen Roark (Ark.), Rep. Paul K. Kille (Tenn.), Rep. Carl Albert (Ga.), Rep. L. B. Smith (Miss.), Rep. S. C. (Rep. Phil) (Miss.) and Rep. Edward Herbert (La.).

Short's defeat will make Rep. Leslie Areeda (Ill.) the top Republican on the committee. Rep. W. Sterling Cole (N.Y.) and Rep. Leon C. Orr (Ia.), two other Republican members, were reelected, but Rep. Lewis Johnson (Calif.) was replaced by a Democrat from California's 18th District.

Appropriations Committee. The

leaders on transportation and military aviation appropriations were all reelected. On the House side, this includes Rep. Clarence Cannon (D-Miss.), Rep. George Mahan (D-Tenn.), Rep. Hiram Shepard (D-Calif.), Rep. Albert Thomas (D-Tex.), Rep. Francis P. (D-Calif.), Rep. Daniel Flood (D-Ill.), Rep. John Taber (R-N.Y.), Rep. Richard Wigglesworth (D-Mass.), Rep. Ernest Stearns (R-Kent.), and Rep. Cliff Cleveland (R-Calif.).

On the Senate side, Sen. Lester Hall (D-Ark.), an aggressive advocate of airpower and the only high-ranking airport construction Committee member up for reelection, won his fight. Other key aviation figures reelected include Rep. Emanuel Celler (D-N.Y.), who heads the Judiciary Subcommittee investigating aerospace aspects of air transportation, and Rep. Melvin Price (D-Ill.), a vocal voice of the airport police of Secretary of Defense Charles Wilson.

Lockheed to Enter Nuclear Research

Palo Alto, Calif.—Lockheed Martin has announced that it will enter the field of atomic research. The research will be conducted at Stanford Industrial Park in a 14,000 sq ft building expected to be completed next year.

The nuclear facility will be a zero power assembly, defined as a reactor that does not have cooling equipment, so that it can only be operated during short periods of time. The assembly, which will be located in a room about 25 ft by 25 ft, will be part of a laboratory where experienced nuclear engineers will be assigned for testing under simulated operating conditions.

In addition to the zero power assembly, the new laboratory will contain a ground level, a steam-driven test Van de Graaff high-voltage accelerator.

Finland Orders Gnats

London—Finland has signed a contract for Lockheed Gnat fighters with deliveries to begin next year. Orders for Finnish Gnat fighters amount to \$4 million. The first order has been placed for September.

Order includes spare and spare engine. Finnish government expects 1 Gnat which will go into production for next year has completed its 4,500 ft. flight test. Company and that is used to give approval of aircraft test program ratings. The engine was run of 1,000 ft (ships) which resulted in almost thrust over 1,000 ft during the whole of morning at takeoff stage.

positive air acceleration, which will be used for research and development engineering of rocket components and systems of components.

\$10.7 Million Program Set for Wayne Major

Detroit—Wayne County Major Airport has announced a \$10,721,124 construction program, including a terminal building with hotel accommodations. Lewis C. Smith, county highway engineer and manager of Wayne County Major, said construction will start next spring and will be completed by October of 1958—the approximate date of American Airlines shift from Willow Run to Wayne Major.

Included in the program is an extension drive to the terminal from the Edsel Ford Expressway, but construction on that project will not start until 1959 and will take an additional \$1 million.

Construction will be financed by federal, state and county bonds plus \$15 million from revenue bonds to be issued next year. The federal government will contribute \$2,531,604, the state of Michigan \$1,255 million and the county \$2,531,611. Air bus 83, 330,000 has been constructed and this is expected to come in the 1957-1958 budget of federal, state and county governments, according to Smith.

A total of \$12 million has already been spent on the airport which is now used by Ten American World Airlines and a number of non-scheduled airlines American Airlines and the KLM Royal Dutch Airlines plan to move from Willow Run.

The terminal building will be four stories high. Passengers leaving on an airline will enter the building from a ramp which takes them automobiles to the front door. Traveler containers and baggage facilities are located just inside the front door. Another road, under the entrance ramp, will run to the east door of the terminal building and will not use the same door.

On the third floor there will be 46 single rooms with baths for persons spending the night at the airport. Car service rooms with facilities for serving meals will be located on the third floor.

Partial parking for 3,000 vehicles will be provided and a 400-ft-long "finger" with space for loading and unloading will be built.

According to Smith the program will complete all planned plans for aircraft loading facilities—but the major money can't be budgeted from the current "big" 7,000 ft by 10,000 ft of new jet facilities require 4



"Eternal vigilance is the price of liberty"

John Philippos Carrion



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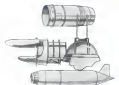
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WASHINGTON, D.C.

News Digest

Hamilton Standard Division of United Aircraft Corp. received CAA approval for a new hollow extruded aluminum propeller blade. It will be used on Lockheed L-1049 and L-1049A Constellation. The blade has a synthetic epoxy filler for support and is socketed place for resistance to erosion.

Nucleus of Navy's first 1,000 mph water lighter squadron is training at Ft. Belvoir, Va. The Navy's first 1,000 mph water lighter squadron is training at Ft. Belvoir, Va. The Navy's first 1,000 mph water lighter squadron is training at Ft. Belvoir, Va.

Boeing is to build a new 14 Lockheed P-2V-5 Neptune by special agreement with the U.S. To be used primarily for training and coastal patrol work, the planes are part of a new plan for replacement of the Hercules in force.

NATO's latest all-weather jet system, North American F-105, is now in full production. The F-105 is now in full production. The F-105 is now in full production.

Lockheed Aircraft Corp. March 1954 Group plant has begun work on testing, delivery and up to the P-104B Starfighter and for McDonnell's F-101 and F-102 Voodoo.

Marine Squadron VMF 122 became the first combat squadron to quickly convert a F-105 to a fighter and is now operating from the USS Saratoga.

Lockheed's California Division has received a \$50 million Navy order for its F-105. The order is for the production of the two-plane jet fighter will now 1955. The fighter, now undergoing check flights at the Naval Air Test Center, Patuxent River, Md., is scheduled to enter service with the Naval Air Training Command in January.

Robert J. Woods, designer of the Bell X-1 rocket research plane, the Bell X-1 and the P-38, died Nov. 1. He had just been named director of engineering and sales of Bell Aircraft Division.

Blocker Aircraft's chief test pilot, Seymour Lender, died Nov. 1, leaving the company because of recurring effects of a spine injury. He received more than a year ago in a fighter crash-landing. In 1953 he flew a Hercules at 717.6 mph for a world speed record.



Bristol Orion Turboprop

Bristol BE25 Orion turboprop, now running on a test bed, will power later versions of the Britannia 100 series. The supercharged turboprop develops a constant 4,400 shp from an inlet to 15,000 ft. and has a cruising horsepower of 3,700 shp at 50,000 ft. Left side of mounted engine is shown at bottom. Series BE25s have been ordered by British Overseas Airways Corp. for Britannia conversions. It also is scheduled to power the British Canadian passenger bus a 100-act transatlantic service, providing meeting service each direction. The engine is 9 ft. 4 in. long and 41 in. diameter at the intake flange.



Eastern Handles Merger Complexities

Be Close, Guys

Market Potential

Market potential in the area is considered by Levens to be good, with industrial development brought about by the St Lawrence seaway project an important factor in the region's economy. Thus the smaller money on the



Data & Surveys

Map of the Eastern United States showing the proposed rail network for the Northeast Corridor. The map includes major cities like New York, Philadelphia, and Washington, and shows the proposed rail lines connecting them. A legend indicates "PROPOSED RAIL LINES" and "EXISTING RAIL LINES".

Meppan's Choice

Segment Class:

Commerce points to a paragraph in the omnibus agreement that requires

LORD mountings protect vital aircraft electronic equipment



Lord mounting base. Assembly gives four-point support of Jet B-1 engine. (Right) Package requires used in F-100 for control system. Design objectives of the mounting base is the protection of critical equipment from vibration, shock, and gust loading.

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LORD MANUFACTURING COMPANY, INC., PA.

Domestic Trunk Lines Committed To \$1.5 Billion Jet Program

San Francisco—Security analysts warning last year against jet transport manufacturing companies' efforts to speed up and size advantages against potential problems of maintenance, traffic control and initial cost before the Security Analysis Society was asked only one challenging type of question.

"Can the airlines overcome the problems that jets are safer?" They were told the airlines first day could.

More Jet Orders

Vietnam orders made by the four airlines.

Paul F. Ford, director of finance of the Boeing Transport Division, Boeing Airplane Co., said:

Large, long-range jet transport in addition to 135 Boeing 707s and 15-17 Douglas DC-8s on order now. Ford estimated that they will be 100-150 more such orders for delivery in the next 5-6 years and another 100-150 in the succeeding five years.

Medium and short-range jets and turboprop-overs and short, the 480 U.S. and foreign types now on order. Ford estimated a world market through the 1960s up to 1,000 airplanes of three types.

Arthur E. Remond, vice president engineering, Douglas Aircraft Co.

Like Ford, Remond estimated traffic growth rate would continue into the 1960-70 period at the same as the 1950 growth from 1948 to 1951. In the transition from the DC-6B, no commercial piston airplane with a seat productivity (payload speed) of 1.45 mph per cubic foot of average cost, to the DC-8, with 4.2 seats per cubic foot, Remond said that the airlines are getting a total cost reduction in effect, at 22%.

Answering that airlines face an increasing capital investment under the same conditions, Remond also pointed out the prevailing trade value of transport assets. At examples he quoted these prices:

DC-7 new, \$3,110,000, going price to day, \$7,500,000-10,000,000.
DC-8 new, \$4,500,000, today \$2,500,000 to \$700,000.
DC-6 new, \$600,000-900,000, today \$1.2 million.
DC-4B new, \$1.5 million, today \$1.75 million.

Constellation now \$700,000 to \$1.3 million, today \$300,000 to \$1.6 million.

The "back door" passes by which jet aircraft will work, their way into the hands of smaller operators will continue, Remond said, because jet transports will be starting a speed program that will ensure constant use at least 10 years and will protect against technical obsolescence.

G. K. Smith, president of American Airlines.

In the 1950-51 period, Smith said, jet transportation grew at four times the rate of increase in gross national product. For the 1955-61 period, American estimates the growth rate will be 3.2 times gross national product.

As a result, American presently estimates the airlines will sell \$4.5 billion passenger aircraft in 1961 compared to \$1.5 billion in 1955 and \$1 billion in 1950.

"Tempering this bright prospect in that productive capacity of the airline fleet will increase accordingly, and there will be increased competition. If the security analyst is expected to evaluate opportunity for individual companies," Smith then cautioned, "it would be well to examine the relative ability of each to manufacture the product."

Increased speed, Smith said, will lighten the timeliness of passengers to prefer specific airline departure times and the flights. This difficulty toward back date utilization can be balanced, Smith believes, in speed also, since a jet transport can make a round trip New York to San Francisco in a 12-hour time. In the end he said, utilization should average about what it does today.

A. M. Vroomer, treasurer of United Airlines.

United's paper jet operation over a year has indicated jet schedules can be made integrated into normal traffic patterns. The federal aviation improvement program and better ground handling techniques will help, Vroomer said.

Operating Costs

As for operating costs, Vroomer said that at very short ranges the jet costs more to fly than the DC-7 or DC-6, but above 400 mi it becomes more economical than the DC-7 and over the 2,000 mi range the jet case begins to approach the DC-6B, hence the United's lower seat cost for engine transport.

From 1,000-2,000 mi, ranges the jet is approximately 10% cheaper to run than the DC-7.

At 1,000 mi, the jet has a fuelburn per engine hour against 12% for the DC-7 and 13% for the DC-6B at 2,000 mi, he said and the DC-6B breaks on fuel factor drops to 10% compared to 11% for the DC-7 and 20% for the DC-6B.

Cost comparisons were made allowing fuel price at 15 cents per gallon, extreme overhead time, 1,000 hr; engine overhead time, 750 hr; airframe and engine depreciation, seven years; residual value 10%. Vroomer said the seven year depreciable life of the jet is quite conservative in view of the difficulties presented by the new technology with the turbine engine.

Vroomer pointed out that the price of the airline ticket is only 1% above 1940 levels in terms of total passenger price.

He expressed hope that the CAB would allow lower fares at current levels as permit an increase.

Maintenance problems, which were discussed with a prima notion of personnel in an engine overhaul, was discussed by USAF at Oklahoma City (AW Oct. 28, p. 12) were touched by Ford, using Boeing experience in a less than 100,000 hr.

Jet engine maintenance hours will be approximately 75% of piston engines per flight hour when jet reach the 11,000 hr. overhaul period.

Airframe maintenance hours will be approximately 10% of piston engines per flight hour.

Military Experience

Related to thousands of passenger airlines, the military maintenance experience, which was better than a 15 to 1 advantage over piston engine types.

Based on military experience with General Electric T17 engines on the B-7 and the Pratt & Whitney R-4600 engines in the DC-97 turboprop, Ford said the T17 exceeded the piston engine of the market in terms of flight hours between overhauls, reaching 11,750 hr. overhaul period, then pushing on to an overhaul 2,000 hr. overhaul period for commercial operations.

Piston engine failures of the jet at 45 failures per 3,000 engine hr and the jet rate of 37 per 1,000 engine hr was well below the 65 rate of the Wright TG-18 piston engines used on the DC-7. Ford said. The improvement from 1951 to 1955 indicates the possibility of cutting the 16 failures per 1,000 engine hr experienced on the R-2800 piston engine of the DC-8.

He said the in-flight shutdown rate on 1,000 engine hr and 39 for the jet, 10 for the R-2800.



He does not fear battery failure. Here's as the time...waiting for clearance...engine on time

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Shows alloy grid after corrosion test



Non-Silvium alloy grid after same test

Exide



Hurel-Dubois HD-321 in Brazil

Hurel-Dubois HD321 at Santa Dumet Airport at Rio de Janeiro attracted most attention of Brazilian in French manufacturers' sales show which also included Nord 2501 "Scimitar" and Dornier helicopters. Powered by two 1,325 hp Wright R52C10B1 engines, HD321 has a 1,330 mi range and carries 46 passengers or 6.5 tons of cargo. Although it demonstrated takeoffs in less than 970 ft and landings in less than 500, Brazilian pilots felt low air scoop and wheel spins might prove troublesome in rough, muddy airfields such as São Paulo and Manaus. Photos show tail design progression. HD311 had been the layout. Prototype HD-320 had single high fin to which two smaller outboard fins were added for production HD-321, the one shown in Brazil.

Arthur Vining Davis Defends Loan To Avlee, Fights CAB Complaint

Washington—Arthur Vining Davis, second Chief Administrator Board of aviation, is using unprecedented steps to prevent the loss in changing his suit with allegedly acquiring control of Avlee, Inc.

The complaint filed by the CAB Office of Compliance, and Davis controls Avlee through a long-term lease to the company. Davis is a Hurel-Dubois who has interests in Hurel-Dubois and Hurel-Dubois.

In asking the Board to dissolve the complaint, Davis attorneys said, the Board would establish a new precedent if it found Davis controls Avlee through his lease. According to the petition, such a precedent would upset banking arrangements of the nation's largest carriers.

Agreement With Avlee
The dispute involved Davis' relationship with Avlee, Inc. The company was acquired by Albert J. Leonard and Ray J. Leonard, who bought half the company's stock over for \$500,000.

Avlee and Davis signed an agreement under which Davis would lend the company \$100,490 to help purchase and dispose of five C-42 transports from the Air Force. Within three of the C-42s were destroyed in an accident; the insurance proceeds were used to reduce the debt to about \$14,000.

The agreement included a provision that the management of Avlee would rest with Leonard Aircraft Sales, Inc. Davis plans to buy the remaining half of the Avlee stock once he gets CAB approval.

Credit vs. Control

In its complaint, the CAB Civil Service Office and Davis acquired control of Avlee in violation of the fact that his loan is so much larger than the investment in the stock issue.

Davis contends that the fact that the management of the company rests with another company, regardless of the possibility of the controlling it. He also said an interpretation of the

law which found that his loan does constitute control would force a reorganization of recent airline financial arrangements.

Such a finding, Davis said, would put the aviation industry "in great danger—the danger that the existence of an individual credit to an air carrier raises a presumption of "control."

Other airlines mentioned by Davis were Eastern Air Lines, net worth \$88,814,000 and a \$60 million loan from Equitable Life Assurance Society; Continental Air Lines, net worth \$5,977,000 and a \$10 million loan from Chase National Bank; Western Air Lines, net worth of \$3,754,000 and loans of \$15 million from the Bank of America and \$12 million from Prudential.



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80 billion miles? That's the distance logged last year by passengers aboard airlines throughout the world. This figure represents an 18% increase over airline passenger mileage in 1964. And the record for 1966 is expected to be even more impressive.

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SHORTLINES

► **Aerostock National Airways** has taken delivery on a DC-6B, bringing the carrier's DC-6 fleet to a total of six aircraft.

► **Bello Co.** has sold two Cessna 140s to Taira Italian Airways. Bello bought the Corsairs from Lazio Aero Italiane.

► **Central African Airways** is beginning Vietnam service to Nouakhot. Viscount flights serving N'Kou, Kert, will now stop at Nouakhot's Gambia Airport at Bisserte.

► **Emery Air Freight Corp.** will buy General Electric four-way radar in its trucks serving the New York metropolitan area after Dec. 1.

► **Flying Tiger Line** reports traffic up 17% in the third quarter to a total of 16,121,125 ton-miles. Flying Tiger flight revenues were \$3.8 million in October, 25% higher than October 1955, revenues.

► **Mohawk Airlines** has opened ticket offices in Erie and Detroit and will operate service to the two cities on Dec. 1. Mohawk has decided to serve Detroit through Willow Run Airport.

► **National Airlines** will offer Florida and Caribbean package vacations for the third time during the coming winter season. The package features 90 Miami Beach hotels and 16 resorts, making 12,000 rooms available between Dec. 29 and April 15. Accommodations also are available in Havana.

► **North Central Airlines** flew 94,921 passengers in October, 38% more than in the previous October and 71% more than in September. This marks the 50th year North Central's October traffic exceeded September totals and brings traffic for the first 100 months of the route to 472,425 passengers as compared with 430,455 for all of 1955.

► **Oriskany Air Lines** carried 14,662 passengers in October, a gain of 35% over passenger traffic in October 1955.

► **San Francisco International Airport** handled 81,251 passengers in September but in comparison with 58,731 in the previous September. Aircraft movements totaled 18,272, a 3.7% decrease from September 1955, traffic.

► **United Air Lines** reports October passenger traffic at 399,967,900 passenger-miles, an 11% gain over the previous October. In the same period freight traffic rose 41% to 5,329,000 ton miles.

AIRLINE OBSERVER

► **August** showcased a letter noted by Civil Aeronautics Administration Administrator James P. Hays as an obvious trend developing. However, he has warned that recent service schedule moves that a record number of the nation's airports are making way for shopping centers, housing developments and industry. For example, Grand Central Airport, Glendale, Calif., is scheduled to give way to industrial facilities; Amersik Airport, Washington County, N. Y., to a shopping center and Trade Airport, Portland, Ore., to a housing project.

► **Canadair** jet transport is being studied by a ten-man Russian delegation, Group, which is now in France, includes Soviet officials and is headed by the top official of the Soviet Aeronautical Institute.

► **Civil Aeronautics Administration** is polling its agencies for comments on a proposed air traffic control procedure that will redefine all "controlled traffic" as "conflicting traffic." This will require issuance of traffic information to all aircraft within certain conditions, adding to the already heavy workload of controllers. Also slated for adoption is a ground procedure that will eliminate controllers' use of "1,000-on-top" for holding IFR traffic during daylight hours. It already is taken during hours of darkness.

► **Capital Airlines**, after experiencing a lull in load factors on its Chicago O'Hare Airport flights, has switched a number of trips back to Midway Airport. Drop in traffic is ascribed by Capital to overbooked West Coast interline connections at O'Hare as compared with the large number of around-the-clock connections at Midway.

► **National Assn. of State Aviation Officials** has adopted a resolution urging the CAA to encourage construction of runways and landing areas at terminal airports for small or STOL aircraft in addition to regular runways. NAAAO argues that expansion of small airports to long runways is uneconomical and causes unnecessary traffic delays of large aircraft and transports.

► **Boeing 707** jet transports ordered by Qantas Empire Airways probably will be powered eventually by Pratt & Whitney J75 engines as a result of a special arrangement with Boeing that permits a transfer of J75 engines for J75, Rolls-Royce Conquers, or any other engine further improved than the J75.

► **Texas World Airlines** engineers have developed a new synchronization and verification system for TWA's Model Q49 Constellation. Installation of the system on the airline's 32 Q49 Constellation starts this month.

► **Sabena Belgian World Airlines** will inaugurate service between Paris and Brussels next March with its new Sabena S-58 helicopters. The Belgians estimate will fly two flights a day on the new route. A morning flight will be scheduled to connect with transatlantic services, and Sabena says it will get transfers to downtown Paris faster than regular airline services.

► **United Air Lines** has dropped the DC-3 from its schedule and is replacing it with Convair service. United is the last of the Big Four to drop the DC-3 from scheduled service. The carrier's DC-3 service is being curtailed and will be gradually phased out in 1957.

► **Civil Aeronautics Board's** investigation of Air Traffic Conference and International Air Transport Association travel agent agreements will deal only with the question of "substance and integrity" of agents. The inquiry will not involve financial agreements on the commission paid to agents by the airlines.

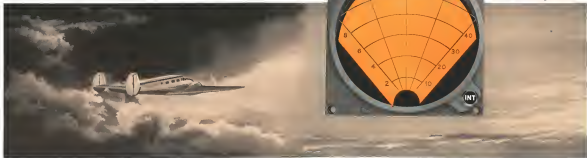
► **American Airlines** has formed the majority of business accounts as competing on the new two-hour ticket pickup plan are in line of it. Out of 401 letters, 120 were favorable, and many of them expressed support for a system of priorities to put seats into the no-show program.

► **General Motors' Allison Division** has ordered a Lockheed Electric test engine in June 1956. The Electric will be used as an auxiliary engine, as well as for testing of the Allison 501 turboprop engine that will power it.

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Subject: MEASUREMENT OF RADIAL RUNOUT

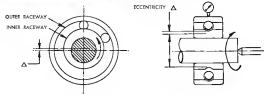


FIG. 1—Measuring eccentricity of bore with respect to outer raceway.

Occasionally confusion may result as to the methods of measuring "in-out-of-round" and "out-of-round". In order to define "radial runout" properly, a distinction of "circularity" and "out-of-round" is necessary.

The amount of out-of-round, or lack of roundness of a given part (inner or outer ring or ball) is the difference between the maximum and the minimum diameter of the part in question.

Roundness refers to the distance between the centers of two circles. Consequently refers to the exactness of the centers of two or more circles. In both cases, measurement bearings start at a very small tolerance on the periphery of eccentricity between the bore and the outer ring raceway, and tolerance between the outside diameter and the outer ring raceway.

Inner raceway out-of-round is measured by forcing the ring between the rounded edges of two flats, one of which is fixed and the other of which is mounted on the indicating mechanism. The difference between the maximum and minimum readings indicates the amount of out-of-round.

Out-of-round of the outer ring raceway is measured by placing the ring between two rounded points which engage the raceway. One point is fixed and the other moves as indicating mechanism as the ring is rotated, the difference between the maximum and minimum readings indicates the amount of out-of-round.



FIG. 2—Inner raceway out-of-round, although eccentricity with bore.

Between the maximum and minimum readings indicates the degree of out-of-round.

The true amount of eccentricity between the bore and the outer ring raceway is measured by placing the ring between two rounded points which engage the raceway. One point is fixed and the other moves as indicating mechanism as the ring is rotated, the difference between the maximum and minimum readings indicates the amount of out-of-round.

eccentricity of the bore with respect to the outer ring raceway, and then slowly rotating the ring to find the eccentricity in the difference between the maximum and minimum readings.

Basically, the eccentricity of the outer ring is measured by the difference in the radial readings with the inner and outer ring held stationary while the outer ring is rotated one revolution. Fig. 1 shows the setup with a zero reading which is eccentricity with respect to the bore.

In the case where it has been stipulated that the bore and outer raceway must not be out-of-round, the only way to do this condition is the true eccentricity measured.

If the raceway is out-of-round, while both outer eccentricity or concentricity with respect to the bore, the out-of-round will be transmitted to the indicator, thereby indicating the reading. A condition in which the outer raceway is out-of-round although eccentricity is shown in Fig. 2.

In view of the fact that the majority of bearing rings will undoubtedly be somewhat out-of-round and eccentric, however slightly, it is obvious that measurement should be made on the raceway surface true concentricity and true out-of-round but a summation of the two quantities. Hence the measurement is more correctly termed radial runout.

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AERONAUTICAL ENGINEERING

"Exotic" Fuels Carry Performance Bonus

By David A. Anderson

New York—Spectacular performance gains for aircraft and missile power plants are measured by new families of fuels synthesized in chemical plants. These specific improvements can be expected in aircraft and engines using "exotic" fuels.

Engine power and aircraft range can be increased markedly. Current calculations indicate that turbojet performance could be bettered by at least 50%.

Fuel weight and tank volume can be reduced. Most of the fuels are lighter than conventional hydrocarbons, gasoline and JP-4, and will show more energy available per cubic foot or per gallon than the conventional fuels.

Engine length and weight can be reduced because of reduction in the length of the combustion process. This design refinement is possible because the new fuels have better flame holding and preignition characteristics during combustion.

Growing List

Spurred by requirements for maximum performance of subsonic and supersonic aircraft and missiles, fuel chemists have developed dozens of new compounds and mixtures which do not exist in nature.

The first list of available fuels for turbojet engines and rockets has suddenly blossomed with scores of new names strange to the accustomed engineer.

Profound among them are the hydrogenated hydrocarbons which hydrocarbons are said to consist of boron or lithium, and dozens of nitrogen or aluminum powder suspended in a hydrocarbon fuel.

A few years ago, these were laboratory concoctions, made in tiny quantities to meet physical and chemical properties. One or two were put into pilot-plant production and made available for limited tests in full-scale power plants.

Now a multi-million dollar industry has sprung out of these test plants, with quantities of compounds for new chemical fuel facilities scheduled for half-dozen different locations around the country.

The recent re-evaluation of the chemically fueled WS-15A bomber delivers writers, after the long and arduous process made in the production and application of the exotic fuels. There is confident prediction that chemical fuels will soon become a reality.

Fuel Comparisons

Fuel	Specific gravity	Heat of combustion	
		Btu/lb.	Btu/gal.
Acetylene	0.8088	20,724	403,558
Aluminum	2.702	12,329	2,344,199
Beryllium	1.85	19,140	3,345,447
Boron	2.3	25,120	3,453,765
Carbon (graphite)	1.25	14,007	1,879,717
Chlorine	0.467	31,370	875,384
Hydrogen	0.070	31,371	325,364
Lithium	0.534	16,448	315,786
Magnesium	0.92	17,740	369,156
Magnesium hydride	1.24	16,448	1,535,464
Phosphorus	0.61	29,327	1,109,193
Silicon	2.4	13,170	1,073,234
Sulfur	0.96	17,140	728,403
Titanium	4.5	16,448	3,369,630
Vanadium	0.78	18,850	770,000
Zinc	0.70	18,492	946,600

fuel production will soon become a reality for the bomber.

Probably the greatest impetus to the production of chemical fuels has been the need for maximum performance of liquid-propellant rocket engines. The years limited to a handful of propellant compounds, all with about the same performance, rocket engines derived of the dry when they could produce a quantum jump in propellant performance.

They studied chemical propellants, calculated their performance, and then began to produce the new.

Today indications are that these will be a fuel to fit every condition, that chemical fuels can be tailored to match a mission in such a way that the fuel is as simple as liquid oxygen and hydrogen. The problems of production and logistics have been studied and soon solved.

Fuel Variety

Tenacious, turbid and oil-soluble, magnet and rocket motor applications can be expected to call for a variety of compounds of compounds for new chemical fuel facilities scheduled for half-dozen different locations around the country.

The recent re-evaluation of the chemically fueled WS-15A bomber delivers writers, after the long and arduous process made in the production and application of the exotic fuels. There is confident prediction that chemical fuels will soon become a reality.

During World War II, the emphasis was on carrying much load and the most needed in the hands has not often more than that had earned in the wings. Now the propellant can be varied.

Fuel and powerplant weight as a constant fraction of the overall gross weight of the aircraft, and the engine can be carried on wings considerably.

Factor in Cost

But more than weight costs, economy is a definite factor. Cost of fuel for a typical military mission is a small part of the total. Doubling or tripling the price of the fuel would be little noticed, particularly if it brought a dramatic improvement in performance of the mission. This is obviously true in the case of expendable missiles.

Consequently the military services are willing to pay for fuels that can promise performance gains, either in increased power and thrust, or reduced weight and tank volume.

There's a secondary reason why some of these new fuels could not be used before. Kerosene and oil-based fuels, and other fuels are not suitable to add or liquid oxidizers. A turbojet engine has to be fueled with a solid oxidizer that will not lose gases or solid deposits on the turbine blades and fuel nozzles. The other engines don't have that worry. Consequently it is entirely possible to have a slurry of magnesium and carbon in a



FIG. 3—Radial Runout is the result of eccentricity in the bearing parts. Principal factors producing it are eccentricity between bore and raceway of inner ring (left) and between raceway and outer diameter of outer ring (right). Out-of-round balls after applicable effect, inner effect tends to correct out or ball out.

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French Anti-Sub Plane Flies

Report 1939 Alouette anti-submarine engine, has made its initial flight. French Navy, which ordered 100, has added an order for 30 more. Powered by a 200-horsepower Daimler-Benz 7-cylinder engine. Also carries a crew of three and is designed for cruise operations.

single engine and almost impossible to use it as the piston fuel in a turbojet.

Comparison of Fuels

Least way to evaluate fuels is to look at the heat of combustion, generally stated in terms of British thermal units (Btu) per pound of fuel. Sometimes when tank space is going to be at a premium as in the case of a short-range submersible vehicle, the criterion should be calculated in Btu per cubic foot of volume. This is one of the reasons why the Germans liked heavy fuel oil for their turbojet aircraft. Forced to use more of it because of the damage done to refineries, the German engineers found that the heavy oil had between 16 and 17% more available energy per cubic foot of tank space. This paid off in range of endurance. But this simple comparison only holds true at low fuel-air ratios, comparable to those obtained in routine operations of a turbojet, where there is an excess of air. Once the process goes toward a higher fuel-air ratio, and particularly where it approaches the stoichiometric (where there is no excess air at all), this comparison is invalidated.

For these conditions, fuels can be compared on the basis of their specific gravities, which are measures of the thrust produced by burning unit weights of the fuel. Specific gravity can be thought of as the reciprocal of specific fuel consumption, it defines the number of pounds of thrust produced by burning one pound of fuel in a second. Since the dependence of this ratio proceeds a fuel density of 7.8 lb/cu. in., the specific impulse unit is expressed in seconds.

Two kinds of specific impulses are used to evaluate fuels and engine performance: • **Fuel specific impulse**, which expresses the impulse in terms of unit weights of fuel, and is generally the parameter used to indicate engine performance. • **Air specific impulse**, which relates the thrust to unit weights of air, and is therefore used to compare air-burning engines such as the turbojet, turbojet-diesels and the ramjet.

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Fuel Characteristics

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between chambers can be used, which in turn means a shorter and lighter engine. This is extremely important in a rocket engine, where combustion chamber length is a major portion of overall length.

The higher flame propagation rate also pays off in the flameholding process. Burning can take place at a higher level in space, which means that the subsonic diffusion portion of a rocket need not be as long as previously required.

Theoretical Example

A quick and simple calculation shows the potential of postburning as a fuel in a turbojet. Assume a single-engine airplane with a 10,000-lb thrust engine and JP-4 fuel for one hour's endurance at full throttle. Assume that the engine specific-fuel consumption is 0.4 lb/HP/hr. Thus the engine burns 4,000 lb of JP-4 per hour. Its tank volume is approximately 150 cu. ft.

Now replace the JP-4 fuel with postburning, making the assumption that the engine remains the same. This is not necessarily true, but is close enough. Then calculate the advantage, considering two operating conditions for the comparison: constant engine thrust, letting fuel mix vary, and constant endurance, letting the thrust vary.

The lighter airplane burning postburning will be able to increase its endurance at full throttle about 30%, still using 10,000 lb of thrust. It would be able to increase its thrust to 13,000 lb for the constant-endurance condition.

These rough approximations to aid



Navy R&D Head

Test Aide, William A. Schmidt, who is assistant chief of the research and development, leads the research team that is working on the development of a new type of rocket engine.

performance point up the great advantage of postburning is a fuel. One possible calculation could be made for weight and rocket engines.

Metal Storage

Solid fuels for powerplants have been tried with varying degrees of success. Rocket and missile tests have been made as far back as World War II with cast, magnesium and just as frequent and successful tests.

One way around the difficulties of fuel feed and injection is by making a suspension of the solid fuel in a

hydrocarbon. This approach tends to minimize the difficulties of feeding and mixing the fuel.

Magnesium has some advantages over other solid fuels that make it worth investigating. For example, it has a higher rate of combustion, and it is more reactive chemically. Furthermore, it can be obtained commercially in a fairly bonded state that is ideal for storage.

Tests have been made of a magnesium slurry in acetone, which is comparable to gasoline. They show that the slurry of half solid half magnesium and acetone, the potential threat of a powerplant using the com-

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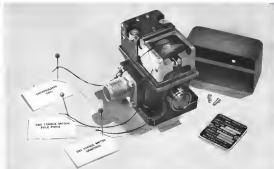


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WS-110A: Supersonic Dash Over Target

WS-110A requirements call for a weapon delivery system with supersonic dash performance over the target.

Early performance could be obtained in the near term program could be developed operating only on chemical fuel or current powerplants could be adapted to burn chemical fuel at afterburner only.

The latest technique is more reliable and provides less complexity.

Boeing and North American proposals for the WS-110A could show a number of configurations based on powerplants which available now or in the near future.

The WS-110A would be able to maintain high altitude cruise speed from takeoff until the start of the dash or subsonic run.

Once headed on to the target, the pilot could cut to the afterburner and obtain maximum dash increase for the dash.

Proven test results of this technique in engine tests plus advances in the chemical production of exotic fuels and particularly performance may have been the major factors behind the selection of the WS-110A and the decision to carry on development along

because a increased rate than 50% over the present work external alone.

These two sets of complex begin to indicate the tremendous potential of new chemical fuels. Problems will be many. For example, performance with performance, as with most of the chemical fuels depends on higher combustion temperatures. The values of temperature are going to be higher enough than current ones to make redesign of the combustion chamber a necessity.

This will in turn call for metal layout developments to produce new alloys, or perhaps will force the way to composite or all-composite combustion chambers.

But regardless of the problems, the new jet pump or powerplant program now is going to grow directly out of the use of these new and exotic propellants.

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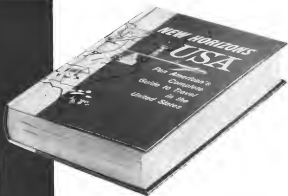
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On a typical drill job the machine will start with a 3,500 lb. bullet of aluminum and as sheet metal cut up with a finished product weighing under 100 lbs., having milled out 90% of the weight in chips. To keep the machine from having stall in chips, the chips are fed into a conveyor belt, which in turn feeds them into mobile scrap bins.

Tilt and Swivel

The large slabs of aluminum are held on positive on the work table by vacuum, and the table can be tilted and revolved to facilitate the cutting of tapered slabs and converging ribs. There are 30 meters in various parts of the machine.

The mill is also helped sideways by the vacuum holding the work drops before a rotation mechanism, the feed stage cutting and retracts. The same thing happens if the tool begins to vibrate. To prevent any danger of a tool cutting too deep and into the hardy metal of the work table, a two inch slab of aluminum is permanently fitted over the whole table area and the work runs on this. First cutting job for the mill was to take a five inch

ing off the whole of five aluminum slab to ensure its complete alignment with the turning head.

The mill weighs 200 tons and runs on 150 cu yd. of mechanical concrete which was laid in one integral pour. Rise of the foundation is four feet thick.

Electronics Controls Spar Milling Machine

The fast 40-ton universal gear milling machine controlled by an electronic control system has been completed for the USAF's Air Materiel Command.

Manufacture of the unit is the General Machine Works, Inc. Control system was developed by General Electric Co.'s Specialty Dept.

Ordered tests as the machine has shown that it is capable of making repeat cuts to an accuracy of 0.002 in. at a carriage feed rate as high as 100 in. per min. and a feed rate of 30 in. per min.

The mill can make from 1-1/2 revolutions or specially cut-tooled systems controlled by the integrated electronic control system.

Major one of the machine will be in manufacturing wing spars, ribs and diaphragms. The system control has to be able to produce simultaneous vertical, transverse and rotational motions

Two spindles each with their own motors are controlled by the system. Two of the spindles are horizontal and two are vertical to give variety of cuts, but the operators is conscious to each unit.

Tools from control system have been integrated into a single machine control, probably the largest of its type ever built. Each of the three systems uses a servo-type mechanism to direct a single machine feed.

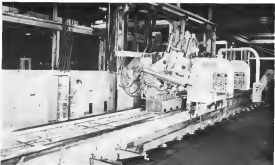
Integration of the control system makes it possible to operate from 1-1/2 feeds simultaneously.

Ordered has previously built smaller systems but similar operated machines and the company has found that as actual production, two of these systems have done the work planned for four of the manually controlled type.

One prime advantage of the control system is that there is only one electrical connection between the complete follower and the machine head.

To shape the follower and the cutting head the operator simply turns a differential wheel at his control station.

GE says the miller is capable of accurate and economical production of duplicate parts, including those that are too complicated for a machinist to turn out manually even at very slow speeds.



FLOOR MOUNTED electric controlling electronic beam control equipment is mounted by operator. One of four milling machines (not visible) is mounted beneath the control. The machine mounted operator control station and pedestal station are at right. Ribs from large fuselage structure mounted parallel to milled wing machine base.

Force Gages Measure Controls

Two sets of spring-actuated force gages are being used by Republic Aircraft Corp. to measure stick and rudder pedal breakdown and maximum deflection forces of the instrumented, prewar flight control system of its latest jet fighters.

Purpose is to determine whether or not the proper force-deflection gradient has been built into an aircraft's control system to give the pilot a realistic "load."

The gages, similar to precision made felt scales, but which can measure both

in tension and compression, are made by the Hunter Spring Co., Lenoir, Pa.

Rudder pedal forces are measured with a Model D-100A indicator with a 100 lb capacity and an accuracy of ± 0.5 lb.

The instrument was especially designed and built by Hunter for Republic for this job. The unit incorporates three 1/2 in. extension only which provides an 18 in. extension for the gage's compression head. This allows the inspector to read the deflection



INSPECTOR reads force-measuring rudder pedal deflection with Hunter D-100A force gage. Extension measuring 18 in. allows contact in cockpit.



MODEL L-39 force gage is used in tension to check F-4H stick force. Compression head is shown at end of gage (right).

having to exceed an unmovable surface in the cramped fighter cockpit. Detachable handles fit on the center of the gage to allow the operator to exert sufficient force on rudder pedals.

Free-actuator and adjustable stick forces are measured with a standard Model L-30 gage, modified to meet Republic's needs, which has a 30 lb capacity and an accuracy of ± 0.5 lb.

All measurements are made with the instrument's compression head except the rudder, stick-back movement. This is done by looping a wire around the stick's grip and attaching it to the gage's back and using the device in tension.

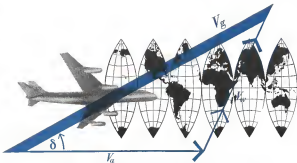
A variety of standard and attachment fittings are provided to simplify performing a large variety of tests.

Buster makes a line of 16 different force gages, ranging in capacity from 1 lb. to 100 lb. All incorporate individually calibrated, compensated spring systems which provide precise deflection.



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to civilian use, they will be guiding commercial jet planes to the remote corners of the world and make far-reaching contributions to fuel economy, passenger convenience, safety, and efficient use of limited air space.



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The Aero 13 intercept control system is another example of Westinghouse creative engineering to solve today's problems—and tomorrow's applications, as well. Information and engineering assistance in specific fields of airborne electronic systems are available to you from Westinghouse Electric Corporation, Air Arm Division, Friendship International Airport, Baltimore 27, Maryland. J-9556-K

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The Rocket Fuels Division of Phillips Petroleum Company operates Air Force Plant 66, a multi-million dollar plant with modern facilities for research, development, testing and manufacture of solid propellant rockets. Exceptional opportunities and key positions are now open to scientists and engineers of proven experience and ability. Challenging opportunities are also available to recent technical graduates, with or without experience. Phillips Petroleum Company is a progressive, diversified company with assets of more than one billion dollars and an already established reputation in the rapidly expanding rocket field.

You are invited to write to our Technical Personnel Office, Rocket Fuels Division, Phillips Petroleum Company, McGregor, Texas. Your resume will receive prompt, confidential attention. Interviews will be arranged for qualified applicants.



Booster Type Rockets by Phillips 66

Above: Great FUSHER rocket, made from low cost, petroleum-derived materials, gives tremendous thrust for short durations.

Left: The M15 JATO was the first of its kind to meet rigid Air Force performance tests. (Boeing Airplane Company photo).



Rocket Fuels Division
PHILLIPS PETROLEUM COMPANY
McGregor, Texas

HUMAN FACTORS

Rocket-Tube Ejector Adds to Escape Margin for Jet Pilots

By Robert Gaskins

New York-Rocket-tube jet ejection, escape outposts is being tested for the Chance F-105 by the Tulsa Engineering Corp., Houston, Texas. The new system uses a rocket motor tube to give added ejection thrust at low altitudes and to guarantee the astronaut deceleration at high speeds.

Standard Catapult

Standard USAF M3 telescoping tube seat catapult is not considered safe for high speed ejection from supersonic air craft. Even though it is currently used on and never was anything but designed for "on-the-deck" ejection, according to experts at the Equipment Laboratory, Wright Air Development Center and in the design design sections of advanced aircraft projects.

In the rocket-tube ejector, the 1 lb first charge ignites when the pilot pushes the eject button and expands in the lower tube, pushing the rocket (which is attached to the seat) out. The pilot then is ejected by the M3. Once the pilot

and seat are high clear of the guide rails in the cockpit, the 5 lb rocket goes to work.

The rocket thrust, directed through the pilot and center of gravity, overcomes to separate the pilot from his disabled ship.

Because it is directed through the pilot's center of gravity, there is no unbalanced torque to aggravate tumbling.

Furthermore, the usual rocket thrust has a forward component which can soften the forward jolt which occurs when the pilot is catapulted straight into the ejection stream.

As a result of this upward stopping of the acceleration, "ditch" pilot is the sudden departure from the airframe carrying him at high speeds which does the greatest physical damage.

Deceleration Force

At speeds over Mach 1 and even at the low speeds of air strikes over 14,000 ft, the total air load on the pilot may easily be as great as 10 g and



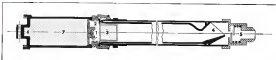
FORCE varies in ejection system use of rocket motor seats. The 4,000 lb. forward component counteracts some 100 ejection force. The 5,000 lb. speed component provides time to height of present system.

the resulting deceleration is high in 400—exceeding the pilot's 15G tolerance limit in the horizontal direction. His critical ejection limit is 20G.

Tolson currently has taken a lead in this new field. In fact, a prototype is completed. But David Tulina, Rockwellville, N. J., who recently learned has own ejection firm, was one of the first to put the concept down on paper. In May 1956, when he was with Rockwell-McDonnell, N. J., Tulina ap-



PRELIMINARY section of Tulsa's rocket-tube ejector is shown in ejection after. Outer container is ejected in ejection (1) and rocket assembly is set right. Plug pin (2) ejected by pilot's eject button ignites tube gun (3). Green 40 chamber (4) and push back lock (4) allowing gas (5) to spring in and the intermediate drive assembly (6) to move forward (to right). Where intermediate drive (6) then against restraint on end of outer container, plug covers then on plug (7) to clear all and gases from chamber (8) to enter nozzle (9) and ejection rocket gun (10).



FULLY TESTED (shown opposite way) and electrical ejection system (1) to push locking beam (2) out and for the tube gun (3). Green ejection nozzle (4) and work against beam (1) to start seat ejection (5). Vent valve (6) in the gun chamber on last day. Seat movement activates microswitch (not shown), fire rocket charge igniter (6), sets off main rocket charge (7). Main rocket charge destroys beam (1) and rocket control nozzle (8).

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Rato Launches Drone Types

Ratoplane RF-77 target drone (above) blasts off from launchers on thrust from ramjet engine and two small Rato rockets. Launcher was specially developed by company. RF-77 is recoverable by parachute. Photograph demonstrates use of a battlefield use of the company for Ratoplane RF-77 modified drone aircraft (below). Time is in series with Signal Corps for tactical reconnaissance. Launching a Rato rocket.



plied for a patent on the combustion principle and presented the combined industrial operator to the Franklin Award.

Last month two drones were tested from a single side TT-102 cockpit in the high-speed sled at Edwards Air Force Base, one drone by a test equipped with the standard M1 double-throw catapult and the other by one of Tokyo's own rocket-take combustion. Current observation reported that the Tokyo equipped drone, went from ball game to three as high as the M1 ejected drone. In addition, the Tokyo drone, had single time for the parachute to open.

Since the test was made at Mach 3, it only separates the new nature's ability to increase take-off and landing interval, situation which occurs less than a large percentage of typical facilities.

Loaded Ahead

The effect of the forward component of the rocket was to move the Tokyo rocket out to land 100 yd. farther down the track so the distance of the drift meters. At Mach 3 neither drone handled well but at higher air speeds the fact that the Tokyo rocket's rocket thrust was directed through the pilot's center of gravity is in-



Jet Airliners ... another Giant Stride in Modern Transportation

Because TIME is the world's most prized possession, today's travelers are demanding planes that will get them to their destinations faster and safer. To meet this demand, two new jet airliner designs—the Boeing 707 and the Douglas DC-8—are already in production. Powered by Pratt & Whitney J77 Turbojet engines (version of the military J-57), they will soon be put into service by airlines loading domestic and foreign airlines.

equipped with main fuel pumps by

GEICO model 500 Main Fuel Pumps, which are standard equipment on all J-57 non-supercharging engines, have now been selected by Pratt & Whitney for the commercial version of this famous power plant.



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Bellows Tie-Rods Control Thermal Growth

These internally restrained stainless steel assemblies are used to control the growth of thermal loads in pneumatic ducting systems by angular deflection. Two kinds are available:



able: a center link bar type and a double pivot type. The first anchors the ends of the bellows at a single point along the bellows center line; the double pivot type employs two pivot points on the bellows center line. In a tension system these tie-rods reduce the bending moments, reduce the column loading and restrain loads at the mounting flanges.

A complete line of aircraft quality stainless steel bellows and ducting components are manufactured by Arrowhead. Other products include pressure compensating chambers, braided bellows and flexible rubber-free bellows ducting. Bellows are made in all diameters from 1" to 15".

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Supermarine N.113

Victory Aircrafts Ltd. Supermarine N.113 on deck cluster of HMS Ark Royal. Note anti-bulging ribs carrying main spar.

The N.113 was the first aircraft built at the factory to check the effect of the rocket exhaust gases on the remaining fuselage. Observations indicated that the rocket gases did not start streaming until the 1,000 psi static pressure of the rocket and the thermocouples located on the remaining fuselage indicated there was an appreciable temperature rise.

Design Details

The diagram (see p. 71) shows preliminary version of both designs. Main difference between the tubes and the bellows sections is in their methods of leaving off the second group for the rocket blast at the proper time and distance along the stroke.

Tubing intended to use a steamswitch involved its ends at the proper place

along the guide rails from there. Tubes are equipped (normally with the Venturi nozzle), even the form of an anti-siphon device, in it about against a travel stop on the outer container (which is anchored to the airframe) to stop off the returning liquid of a small ring discharging the tube chamber from the rocket chamber. The last point then flows through the nozzle into the rocket chamber and up the rocket charge pipe.

The same and timing of the rocket blast is the greatest single problem, that and if it does too soon it may fill the cockpit with fumes and give the pilot too great a g-jolt too late and do a broken down in the first case. The amount of charge, must be in with the timing.

An over-ride button upon the start and M1 output first action, button has added a simple spring loaded valve

200 gpm fuel flow— shut off in 1/4 second!

Here is the highly efficient new fueling shut-off valve, designed by Whittaker to solve the problems involved in shutting off the high velocity, high pressure flows during inflight and ground fueling operations.

The shut-off valve is a pilot-actuated, piston-powered Bopper type. This design provides rapid shut off by utilizing the dynamic energy in the flow stream to augment the force obtained from the line pressure in the actuating piston.

A surge relief valve, consisting of a so-called pilot and main valve assembly, is provided to limit surge pressures to 120% of line pressure.

The valve is designed to be installed in the fueling line and within the fuel tank. The pilot line and surge control port is vented into the tank, making it possible to shut off a 200-GPM flow in 250 milliseconds with an over-vent through the fueling line of only 75 gallons.

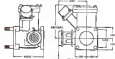
NOTE: Bopper shut-off forces are balanced by the actuating piston to enable the Bopper to be opened against the maximum line pressure. This surge relief valve employs a co-actuated pilot assembly to obtain maximum pressure loss and accurate control of both cracking and recast pressures.



PERFORMANCE

SHUT-OFF VALVE—2" line size. Rated flow—200 GPM at 150 pressure drop. Rated pressure—110 PSI. Actuation time—250 milliseconds at 200 GPM and 110 PSI. Pilot valve—1/8 to 20 Volts D.C., 15 Amps maximum at 30 Volts.

RELIEF VALVE—Cracking pressure—125 PSI. Full relief flow 250 GPM—110 PSI.



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RESEARCHER'S NOTE: This research was supported by the National Science Foundation Grant #0809672.



Martin Mancovers

Marsh FIM demonstrates water nonwettability with Marston-developed hydrophobic. Flaps on both sides of our tool can be used individually as rulers or as brake when spread together. Device also can be used as screw driver.

THE INFORMATION ON THIS PAGE IS TYPICAL OF THE DATA YOU WILL FIND IN THE NEW AIRBORNE CATALOG

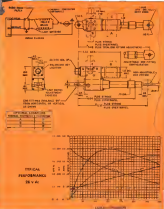
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- 4) Unit includes lead antimony externally adjustable through entire length of stroke, pivoted overload switch with fused circuit, and anti-backlash device.
- 5) Maximum operating load—250 LB. (Upstart stroke load=1000 lb. for 12 inches maximum extended length)
- 4) Weight 630 LB.
- 6) Plus 0.010 in. 2 stroke in. inches. Plus 0.010 in. for thermal overload protector.
- 5) Minimum dimensional tolerance +.015 in. unless otherwise specified.
- 6) Dimensions given are maximum lengths to drive stroke. To determine maximum length for required stroke, add three plus three minus three plus three plus three adjustment.



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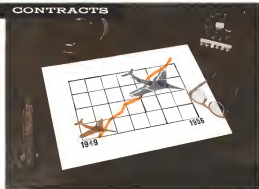
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When the airplane destination lies outside the local ARTC control area, the controller must call the adjoining ARTC center, and each transmits information on the flight to an assistant controller there. Over again flight progress strips must be manually prepared and returned there over items must be calculated.

The first phase of TDC's program calls for the development of a system which will permit all flight plan data to be transmitted to ARTC Centers,

ENGINEERS: For complete details of the Temco story of contract opportunities in all phases of engineering, visit Joe Russell, Engineering Personnel, Room 204, Temco Aircraft Corporation Dallas, Texas.

AIRCRAFT CORPORATION DALLAS

AVIONICS

Datamation: Third Hand for Controller

By Philip J. Khan

Indications—Both automatic and built-in control coordination systems which will use electronic data processing data instead of tape to solve, but not replace, the overburdened traffic controller's under development at Civil Aeronautics Administration's Technical Development Center (TDC).

Details of this new research and development program were reported here during the recent Fall Assembly Meeting of the Radio Technical Committee for Avionics, by G. E. Linneman, chief of TDC's Air Traffic Control Equipment Branch.

TDC is taking an evolutionary rather than revolutionary approach to automation of the existing traffic control system. This will permit processed introduction of improvements and simplify the transition. Much of the program is sponsored by the Air Navigation Development Board.

Automation Barrier

Biggest barrier to the use of electronic data processing techniques is that Air Route Traffic Control Centers now receive aircraft flight plan information as text from a non-computerized circuit accept.

When the flight plan information is telegraphed into an ARTC Center from an airline office, military operations center, or Instrument Approach Communication Station (INACIS), an assistant flight controller must prepare several flight progress strips, one for each of the sectors through which the airplane will pass. (Clockwise from right.)

These strips show altitude, identity, direction, speed, destination, mode, as well as extended range of arrival over each sector. This has to be calculated by the assistant controller, and must be revised on each flight progress strip in event of course delays.

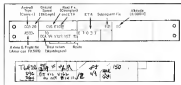
Flight Strips

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The first phase of TDC's program calls for the development of a system which will permit all flight plan data to be transmitted to ARTC Centers,



FLIGHT plan data stored on magnetic discs can be updated by controller to correspond to new position report. System will automatically compute ETA and pass out . . .



FLIGHT progress strip (above) which will replace manually written strip (bottom).

and between centers over concentrated teletype circuits. Local office, INACIS, or military operations offices will file their flight plans in terms of a push button keyboard, or by means of punched cards or perforated tape. (See more and the device might resemble the present office machines can print hardcopy. Strips will be calculated for checking the latest of the flight plan message.)

Automatic teletype sending centers will send the message into the proper ARTC Center. Here it will feed into a digital computer and magnetic storage device. The computer will determine how many flight progress strips are required for the particular flight and what time the strips are created to

serve over each radio. Ex. Teletype printer within the Center will then print out the required number of flight progress strips for each sector and these will be manually inserted in the strip holders. (See top photo.)

Revised ETA

If an aircraft is flying into an adjoining ARTC control area its flight plan must be transmitted to the new ARTC Center about 20-30 min. before the aircraft enters under new control. The proposed computer will automatically transmit this flight plan data to an adjacent ARTC Center computer and magnetic storage where the same procedure of computing its ETA and printing out flight progress strips will be



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When temperatures drop, Packard PE-400 doesn't stiffen, either. For

example, at -90° F. it still flexes easily and there's no cracking or coating of oxidation.

Packard PE-400 is made to greatly exceed the requirements of military specification MIL-W-7139. This outstanding cable gives high aluminum resistance and its construction provides a hermetic seal against moisture and chemicals.

You can print on the uniform, smooth coating and the cable is available in solid colors and in white with colored

markers. Facts are available that prove convincingly Packard PE-400 is unequalled by any other cable of its kind! Ask for it today. Packard Electric maintains branch offices in Detroit, Chicago, and Oakland, California, for your convenience.

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Packard Electric
Wires, Cables

"Let 'Em" deliver it to you! Write.

accomplished. If radio-telephone reports from the pilot indicate a change in flight plan, the controller will use a push-button handset to set these reports into the stored flight plan data before it is transmitted to the adjoining carrier.

TDC intends to investigate the operational feasibility of printing received flight program status whenever an aircraft is reported inside by radio or telephone indicates a change in ETA. This would require the traffic controller to enter the new data into the computer by action of the push-button handset, sending it to recompute and print out revised flight steps.

It may prove easier for flight controllers to erase out and write in the new flight data rather than punch in the data on the handset and then replace old flight data with new ones by hand.

However, in the second phase of TDC's program, such semi-automatic parallel revision of flight data will eventually become feasible.

Phase II

In the second phase of TDC's development program, the longest flight program steps will be replaced by electronic displays using spot of cathode ray tubes such as the Coaxial Cathode or Helix-type. These probably will display information in such the

same fashion as present flight steps do. However, each flight automatically will be displayed at the proper time sequence in the order of its estimated ETA once a routing fix. When a position report is received by radio or telephone, the controller will use a variable handset to correct the flight data displayed and this will automatically feed the revised data into computer storage.

Warning Light

The computer will then recompute ETA estimates over all subsequent fixes and automatically transmit the revised flight data to the displays of adjoining radio traffic controllers. When such data resources are made, a light will flash to alert the controller of the change and continue flashing until the controller acknowledges fix to be in case of the change by pushing a button.

Because flight data on all controlled flights is stored in the computer, and periodically updated, the controllers have no radio-telephone reports. The computer will be able to determine roughly whether variable operations are being maintained. The computer will also be able to look ahead for possible conflicts, and warn the controller by means of flashing lights.

Growing use of peripheral (remote) VHF stations that permit direct radio contact between ARCC controllers and the aircraft they are controlling raised

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minimum protrusion

NO SHEAR rivets have the smallest headless rivet of any high strength fastener.



maximum smoothness

The smooth, splintered free end eliminates chipping of material from holes in other equipment. NO SHEAR's aluminum heads in aircraft cover which are accessible to the deck or main fuselage areas, passengers and cargo.



less weight

NO SHEAR rivets are the lightest standard high strength fasteners used in the aircraft industry. Standard fasteners are 20% weight above when based on AN SHEAR MS20-6's as per MIL-H-8000 compared to AL-2, AL-3, AL-4, AL-5 and AN-100 30 series.

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"Buying with NO SHEAR for latest shop working standards."
NO SHEAR is a trademark of
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Prototype Vortac DME

Vortac DME, first equipment to be developed following recent evolution of Tacan technology, is shown as prototype model weighing 35 lb. and occupying 1 ATR size case (interior). Unit was developed by Federal Telecommunications Laboratories and produced by its affiliate, Federal Telephone & Radio Co. Vortac DME utilizes distance measurement from ground Vortac stations to be installed in VOR sites. New 11 ATR size unit (the 1400 is being shipped) which can be installed in Vortac DME in portable Vortac housing installation. DME is custom model based on central coding system or with its own or blowers.

BALLISTIC MISSILES

on target
a continent away
through Burroughs
computation

For some time, Burroughs has been participating in the U. S. Air Force Ballistic Missile program in the field of guidance. This program consists of two intercontinental ballistic missiles, Atlas and Titan, plus an intermediate range missile, Thor.

Here's more proof that in its specialized areas of computation—instrumentation, control systems and data processing—Burroughs has what it takes to shoulder the overall responsibility for defense projects from beginning to end: (1) from research to development, (2) engineering and testing, (3) production, testing, field service and training.

We welcome inquiries regarding defense contracts in all areas of our demonstrable responsibility and competence. Write, call or wire Burroughs Corporation, Detroit 32, Mich.

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Burroughs Research Center, Plain, Pennsylvania
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Electronic Instruments Division, Philadelphia, Pennsylvania
Electronic Tube Division, Pittsburgh, M. J.
The Todd Company, Inc., Rochester, N. Y.

Burroughs
The Foremost Name
in Computation



Looking to future expansion, Burroughs borrows ingenuity from qualified engineers.

of working through radar radio stations has made it more difficult for radar dispatchers to keep track of flights. When the second phase of the system is operating, radars will be able to interrogate the ARIC Center computer storage drum and obtain instantaneous early information on the ETA of these aircraft.

The system also must be tied in with the air defense SAGE system to permit the exchanging of information on the position of each military aircraft.

Phase III

The final phase of the program calls for the use of long-range position data such as that obtainable from improved data link (transmitting aircraft bearing, distance, and altitude), and from ground radar when aircraft are equipped with transponders because they provide positive aircraft identification.

The precise aircraft position data will be available as previously a cautious turn compared to the present reliance on radar radio position reports. This instantaneously derived position data will be fed into the computer and magnetic storage drum, permitting more accurate control and resolution of conflict than possible in Phase II when, infrequent radar radio position reports are the only source of information. Phase III will still require controllers, with a potential display of aircraft position as well as the distance flight progress ring top, in place.

TDC hopes to obtain 10 per cent. Read (Phase I) Computer and upgrade to the fourth Phase I system in April by the summer of 1958. Estimates are that this program will require 100 man-years to complete. Phase III requires 200 man-years, and computer experts in required, and work out computer programming problems.

Military Liaison

TDC group located in the Lincoln area is working closely with Lincoln Laboratories and Air Force Goddards. Burroughs Center is obtaining information on the latest guidance developments in electronic display techniques for application to Phase II and Phase III of TDC's program. If sufficient funds are made available, it may be possible to start experimental Phase II system will be in operation at TDC in late 1958.

Barring a major increase in the program price, this indicates that the current implementation of the Phase I system in the ARIC II ARIC Center is probably around 1960-61, with Phase II implementation in 24 months after.

However, TDC also is investigating an interim measure which might provide more immediate relief if it proves operationally feasible. TDC will use

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NEW BENDIX TRUE MASS FUEL SYSTEM APPLIES ANGULAR MOMENTUM PRINCIPLE WITH SINGLE TURBINE

Increased accuracy and greater reliability are the two big advantages of the new Bendix Single-Turbine Mass Fuel Flow Transmitter designed for engine applications in both single- and multi-engine jet aircraft (Type 5124 Transmitter is shown above).

The simplicity of the Single-Turbine Type Mass Fuel Flow Transmitter is shown in the diagram, regardless of flow rate, type of fuel, or environmental conditions. The new, single turbine is responsible for the greater accuracy, because of its reduced friction, reduced fuel complex, and simplicity in service adjustments.

The simplified design and lower price of this Bendix engine instrument

can transmitter also make possible longer, more trouble-free service life, and its use to measure flow in other directions.

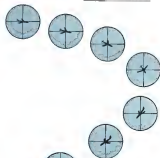
Other advantages: low pressure drop, light weight, available in a variety of flow ranges to fit the application.

While this transmitter is new, it fits into a variety of programs—both new and old. Ask us for complete details specifying desired range, pressure—central division, BENDIX AIRCRAFT CORPORATION, DAYTON, OHIO.

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Iso-damp Mounts



If anything needs isolation from shock and vibration, it's an electronic target-seeking mechanism. Trouble was that ordinary roll mounts aggravated the disturbance in order systems caused malfunctioning.

The answer? A special mount designed by MB with enough soft cushioning action to absorb vibrational interference, and an ingenious internal damping mechanism to curb resonance.

Satisfying special needs in vibration testing as control has been MB's chief business for 17 years. If you have a problem with vibration, take advantage of this kind of successful experience.



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A Division of Raytheon Inc.

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REMARKS FOR PRODUCTS TO ISOLATE VIBRATION

TO EXIST IT TO ADJUST IT

take delivery of an IBM 650 computer which will be programmed to compute estimated time of arrival over a radio fix and produce printed flight progress strips.

When flight plans are received by user, the data will be taken down in pencil then used to prepare a punch card. When the punched card is introduced into the computer's card reader and punch device, the computer will calculate fix, ETA's and produce printed flight strips for each sector, similar to the one shown on p. 33.

This will eliminate some of the workload from the assistant controller, but will require the additional step of converting written flight plan data into punched card form.

Major Gains

However, TDC is paving its hopes on the more sophisticated Phase II system. "If provision can be made for recording flight data properly, and introducing and storing data flight data in an electronic manner, a major breakthrough will have been accomplished toward the ultimate semi-automatic system," Foreman told the ATCA Assembly.

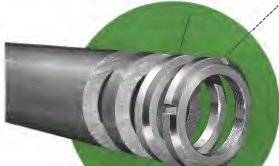


(Editors note: The following items are highlights of reports of Radio Technical Commission for Aeronautics' special conventions given during the FFA Assembly meeting in Indianapolis.)

► **ATC Beacon System (SC-64)** Studied an air traffic system to determine whether the number of ATC two-frequency radio modes can be increased from the original authorized 16 to the 64 modes which are technically possible. Civil Aeronautics Administration says it can make effective operational use of 64 modes. Final decision is up to Defense Department.

► **Jet Aircraft High Altitude Operational Requirements (SC-74)** Concluded an investigation indicates that jet engines will probably operate at altitudes of 70,000-75,000 ft. earlier than at altitudes above 60,000 ft., according to Chairman Capt. J. D. Smith of the Air Force Pilot's Assoc. In each case efficiency and prop-driven engines will be operating at the same altitudes during various overlying problems, Smith said.

► **TV Interference in UHF Band (SC-68)** Tests indicate that UHF television stations will not interfere with DME equipment providing the station is equipped with 55.98 db of harmonic suppression. Tests were run



24% Production increase at Standard Locknut & Lockwasher, Inc. after switching to OSTUCO NP-60 tubing

Standard Locknut & Lockwasher, Inc. Indianapolis, Indiana, Tubing experts from OSTUCO recently recommended a switch to NP-60 Tubing specially processed for machinability for Standard's locknut and lockwasher line used in ball and roller bearing applications.

Standard components find their way into electric motors, machine tools, automobiles, aircraft frame and construction equipment. (This company, with highly diverse applications, reports similar success with NP-60.) If you are machining bearings, washers, collars or any similar part, you'll do well to check into the needs of OSTUCO's new NP-60 seamless steel tubing.

GET NP-60 WITH "SINGLE-SOURCE SERVICE."

New NP-60 seamless tubing comes to you with OSTUCO's unique "Single Source Service"—experience and facilities for design and development, production and delivery all under one roof. Get together with a tubing expert for preliminary planning on NP-60's possibilities in your product. Contact your nearest sales office or write direct to the factory.



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TULSA • TULSA • TULSA • TULSA
WHEELING, W. VA. • WHEELING, W. VA. • WHEELING, W. VA. • WHEELING, W. VA.

OUT OF THIS WORLD

in the SATELLITE

Hundreds of miles out in space a rocket burns out... and back on earth,
optic and electronic instruments begin tracking the first unmanned

Satellite as it is launched into its orbit.

Speeding into outer space is perhaps the most rigorous test of components
that man has ever devised.

Marin, Bellmore, prime contractor on Project Vanguard, has specified A.M.P. Terminate
and Connectors for the Project because of their proven dependability and excellent
quality. Aircraft Marine products have always been designed to be
ahead of the present and ahead of the future.



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Winco dynamotors qualify

for Signal Corps Reduced Inspection Plan



WINCO®

Power for the nation's
mobile communications



The Wincharger Corporation's long history of producing dynamotors equal to or better than the Acceptability Quality Level established by the government has resulted in the Signal Corps' selection of Winco dynamotors for its Reduced Inspection Quality Assurance Plan.

As of this writing, Wincharger is the only manufacturer of dynamotors qualified under RIQAP. Only those companies who have consistently furnished material of the highest quality level and who maintain quality control and inspection methods and procedures acceptable to the Signal Corps are considered for this honor.

This new Signal Corps plan places more responsibility for maintenance of quality on the manufacturers by reducing the amount of government inspection. It is an intense inspection program.

What does Wincharger qualification for RIQAP mean to you — further evidence that you can depend on Winco Products?

WINCHARGER CORPORATION

Staten City 3, Iowa
Subsidiary of Zetel Industries Corporation

providing adequate communication equipment for small single-engine aircraft is acute because of the cost (\$2,000) and weight (90-100 lb.) according to Communicator Chairman H. E. Telle. Communicator is seeking to establish an interim standard which will make it more attractive for small aircraft owners to install VHF equipment with sufficient clearance to avoid an air traffic control radio. This objective, according to Telle, that present lightweight radio equipment often is linked to such aircraft manufacturers' cockpit.

• **Audio Response of Air-Ground Communications (AG-72).** Recently available data indicates that an audio spectrum of about 400-5,000 cps is optimum for ground-air communications, but the optimum spectrum for ground-to-air may differ from that for air-to-ground. Automatic volume control is commonplace for different human voice techniques might provide at least 5 db gain. According to Communicator Chairman J. A. Parviz: Data on USAF conducted attendance studies, which may shed further light on the problem, is expected to become available this month.

Expansions, Changes In Avionics Industry

Chicago Association is made of more companies headed by Dr. John V. N. Granger, former assistant director of engineering and head of the Radio Systems Laboratory at Stanford Research Institute. New line will specialize in radio and radar systems for the Military, Science and commercial markets. Company has headquarters offices at 505 El Camino Blvd., Menlo Park, Calif.

Other recently announced moves indicate changes and expansion in the field.

• **International Business Machines Corp.** has opened a new computer research laboratory in Zurich, Switzerland. Present staff of 50 persons, Zurich Swiss, is headed by Dr. Anthony P. Spencer, assistant professor at the Swiss Federal Institute of Technology.

• **Revere Instrument Corp.,** New York, has opened new West Coast office at 1216 Lytle St., Santa Monica, Calif. New office is headed by Robert T. Howard.

• **U.S. Dynamics Corp.,** Boston, has moved into new 20,000 sq. ft. facility at 1210 Columbia Ave. from previous quarters and other accommodation.

• **DeJong-Avionics Corp.** has opened its regional branch office at Beach 114th, Cliff in Honolulu on Oahu and has

opened new offices at 405 North Maple Drive.

• **Electronic Engineering Co.,** Palo Alto, Calif., manufacturer of electronic components and computer, has moved to new 92,000 sq. ft. plant at 1912 E. Alhambra Ave.

• **Serovachianese' Western Division** has leased 15,000 sq. ft. of additional area at 1521 Sepulveda Blvd., Los Angeles, to house its engineering, account mg., and administrative personnel.

• **General Precision Laboratories** has started construction of new 27,000 sq.

ft. expanding building at Pleasantville, N. Y. The second major addition to its engineering facilities in the past two years. Completion is scheduled for July, 1957.

• **G. H. Roland, Inc.,** Dayton, Ohio, has leased four-story building providing 50,000 sq. ft. of additional facilities. A 50% increase in company floor space. New plant is near firm's present main plant.

• **U. S. Engineering Co., Inc.,** division of Lohm Industries, has moved to larger quarters at 5571 Redwood Road, Los Angeles 16, Calif.

**PLAN AHEAD
WITH GYROS BY DARCO**

When you're running the complex and delicate control system, you keep it steady. You maintain a constant latitude and longitude. You maintain the altitude in precise increments built to maintain the highest degree of accuracy through extremes of shock and temperature. **GYROS by Gyro-Dynamics Division of Darco Industries.**

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With UDOFT directly designed to help develop advanced avionics systems, engineers at Sylvania's Avionics Laboratory design designs of an extremely high speed digital computer system. From 100 to 100,000, P. M. Smith, and John Tennen.

**The right people with the right facilities
produce the right solutions**



Computer development engineers
S. B. Price (left) and A. J.
Quinn (right) look at data
on computer printout of space
program from wide digital com-
puting system at the Sylvania
Laboratories.



New Sylvania Wildlife Laboratory,
designed to conduct program related
to wildlife studies and studies of
birds. The 100,000 square foot of floor space.

UDOPT

—new electronic "brain" to train jet pilots

UDOPT—the first Universal Digital Operational Flight Trainer—will use a new electronic "brain" to simulate flight and combat conditions of a wide variety of jet aircraft for training pilots.

A Navy-sponsored project of Sylvania's Avionics Laboratory, the UDOFT system is simulated around a new digital computer of great flexibility, speed, and accuracy which is being developed to take the place of numerous special-purpose analog computers currently being used in Operational Flight Trainers.

Highly advanced electronics projects of many kinds—ranging from a practical, producible solution for a specific

problem—to one constantly being carried out by the scientists and engineers of Sylvania's Electronic Systems Division, of which the Avionics Laboratory is a vital part.

In all of Sylvania's Electronic Systems Division installations, the right people work with the right facilities, within a sound managerial environment. That is why they have produced right solutions to a variety of problems and have made many important contributions in the fields of aviation electronics, guided missiles, communications, control systems, radar, computers, and control systems. Whether the problem is military or in-

dustrial, Sylvania's business is to come up with solutions that are producible.

Facilities of the Electronic Systems Division include an manufacturing plant and engineering laboratory at Bedford, New York; the Avionics Laboratory, Missile Systems Laboratory, and Applied Research Laboratory at Melville, Massachusetts; the Electronic Defense Laboratory, Microwave Tube Laboratory, and Microwave Physics Laboratory at Monroeville, New California. All of these facilities are staffed with top-ranking scientists and engineers, backed with Sylvania's extensive resources in the electronics field.

SYLVANIA IS LOOKING FOR ENTERPRISING ENGINEERS

Sylvania has many opportunities in a wide range of defense projects. If you are not now engaged in defense work, you are invited to contact Edward W. Davis, Manager of Personnel, Electronic Systems Division, Sylvania Electric Products Inc., 100 First Avenue, Waltham 54, Mass.



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Light Ammunition Chute

Lightweight, flexible ammunition chute is constructed of self-interlocking purb webbing, meets an excellent fastening, designed to hold rate of fall, it cuts weight about 10% from conventional chuting. It will be available in aluminum, titanium, steel and mild steel. Immediate production is planned for 18 inch and 30 inch ammunition chutes. Production for other calibers may follow.

Amament Company, Inc., Santa Ana, Calif.

Airborne Dew Point Meter

Small self-contained electronic dew point hygrometer measures over range from -100°C to +100°C with accuracy of $\pm 1^\circ\text{C}$ at pressure of 10 k. Sample gas with flow rate from 900 cc to 2,000 cc per minute. Two photoelectric light source sensitive for density on a flat surface coated by water, CO₂, carbon tetrachloride and heavy by air.



ducting coil. Amplified photoelectric output balances chuting and heating at the desired warm temperature and provides indicator signal. Hygrometer is introduced as airborne unit, may be purchased to use 60 or 400 cycle 115 volt source. Dimensions are 7-1/2 x 16 x 16. Barlow Mfg. Co., Santa Monica, Calif.

Hydraulic Jacks

Line of hand powered hydraulic jacks designed especially for raising operations on crashed vehicles and other collapsed structures is available. Push-Pull jacks are made in 4-10 ton ratings. They can be used to push, pull, spread or clamp. Force is transmitted from the pump to the ram by a long flexible hose for the safety of the rescuer. In second order the ram can be used to spread collapsed cars or lift debris from crashed aircraft.

Blackhawk Mfg. Co., Dept. 88, 1323 W. Rogers St., Milwaukee 45, Wis.

Molded Radiation Shielding

Lead-plastic compound, called Leadac, may be pressure molded to a tolerance of ± 0.001 in an automatic molding. Containing 95% lead, it is harder and more rigid than pure lead and when molded around a structural member has excellent bonding characteristics. Thickness can be controlled.



from rubber-like consistency to that of cast aluminum by varying lead content. Upper limit of lead content is 95% by weight. For additive absorption of radiation or increased shielding are metal, another or compound may replace lead. Small or large runs may be added at low tooling costs.

Teletron Industries Corp., 1515 57th St., Long Island City 1, N. Y.

Survival Kit

Polyethylene global survival kit developed by USAF's Aero-Nuclear Laboratory supplies oxygen and pressure for high altitude escape. The 70 cc. of oxygen carried is adequate for 18 men. When survival rescuer altitude low enough for breathing of outside air, decompression is pulled and oxygen replenishes breaks away in the kit drops to the end of a 12 ft. line. Kit then spins, like a top, and sets and sets up in 10 seconds to show survival's descent in kit boots and chute is released of its weight. Once in the water, survival can pull in kit and board out.



in 10 sec. Equipment vacuum proofed in hot water, radio, radar and sonar receiver, radio, fishing gear, water proof, sleeping bag, food, first aid kit, etc.

H. Koch & Sons, Santa Monica, Calif.



Strain Gage

Wideband high temperature strain gage has dynamic range up to 1,000%. Gage can be spot welded to flat or curved surface and ready to operate in less than five minutes. Tests show that it will resist spot welding in insulation means no significant distortion of the structure being tested. Available gages have nominal resistance of 120 ohms and gage factor of 1.80. Lengths and widths of two types available are 1.25 X .125 in. and .250 X .125 in.

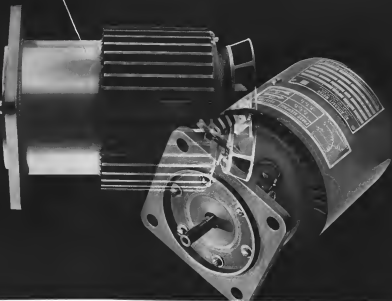
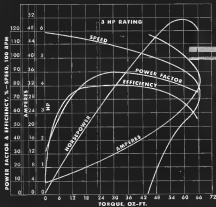
Micro-Tek, Inc., 615 N. Synthesis Ave., Los Angeles 35, Calif.



Temperature Probe

Adaptive responsive probe measures ambient nitrogen temperature in aircraft and missiles. Designed for telescoping and control and for sen-

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to stratosphere

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These new a-c motors meet the general requirements of MIL-M-7908A. They are designed to drive a variety of turbines, pumps,

compressors, blowers and actuators. They are totally-enclosed or through-ventilated, self-cooled and explosion-proof. Locked bearing construction gives longer bearing life when subjected to shock and vibration. Simplicity of design permits easy maintenance.

Westinghouse engineering and experience is available to you now to solve your motor problems. For complete information call your Westinghouse sales engineer or write: Westinghouse Electric Corporation, Aircraft Equipment Dept., Lima, Ohio 43032.



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"TERRIER" -ready for action!

ONE OF THE MOST potent defense weapons now in use by our Navy is a spontaneous, rocket-propelled, guided missile called the "Terrier". With speed, the job of this electronically controlled "warhead" is to track down an enemy and put him out of action before he can strike.

Working in close cooperation with the Armed Services on this guided missile, Philco research, engineering and production have made important contributions to its development. This has been possible only in connection with the primary task, the mechanism which controls the effective target range and enables the "Terrier" to determine an accurate moment of impact in the vicinity of the intruder.

From the first sketch to the final, representative mechanism, Philco conceived and completed that assignment in cooperation with the Navy. Philco's world famous scientific knowledge and skill is a guarantee factor in the development of tomorrow's defense for your present and tomorrow's quality products for better personnel living throughout the world.

U.S.S. Boston, the Navy's first guided missile ship with its "Terrier" ready for action, as it was commissioned at the Philadelphia Navy Yard.

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PHILCO CORPORATION

Government and Industrial Division, Philadelphia 44, Pennsylvania



ing of temperature data is always critical, it offers a recovery factor of 0.995 with response time of 0.25 sec. at 100 and capacitance within 0.5% allowing it to stabilize steel lightly polished to measure consistency and reduce measurement friction. Low drag load gives superior performance over plastic tape from 500 to 10,000 ft. Min. 2.0 in. diameter up to 60,000 ft. Two heat sensitive temperature elements are available to provide a split size of resistance output proportional to continuous temperature responses. C. M. Cameron & Co., Inc., 918 E. Grant St., Pasadena 1, Calif.

Resinase Insulation

Resinase composed insulates metal surface against machining 1,000° for 10 minutes while subjected to 2,000° flame. Heat-treated black matrix for standard can be ground or tumbled to a thickness of 3.0 in. on cast, wood, fiberglass and other materials. Does not run, drip, or burn. It is



resists condensation, rust and weathering in the temperature range from -20 to 250°F. The matrix withstands acid and alkali fumes and splashes and will not support oxidation.

Resinase Corp. of America, Dept. A-8, 7750 W. Glen Pl., Skokie, Ill.



Miniature Differential

Miniature differential is adaptation of small planetary gear reducer. Bandwidth speed of the output shaft is difference between speed of input and that of the independently driven internal gear. Holding one input input constant and turning the other produces output speeds ranging from 5 rpm. in one direction to 5 rpm. in reverse. Load ca-



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Now you can enjoy the high strength-weight ratio of magnesium at high temperatures. After now being cast by Rolfe into the tensile strength and creep resistance modern jet and missile demand... even at temperatures above 600°F.

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MEN and the MOON

Ten years ago when the University of California at Los Angeles offered the first college course in extraterrestrial space travel, the same made headlines across the country. What made the announcement more newsworthy was the fact that the class was mediated by one of the most highly respected astronomers in the U. S. — Dr. Bernard Kinoshita. Since then the world has caught up with Dr. Kinoshita and the possibility of a manned mission to the moon has become a very practical possibility. Today, at Systems Laboratories, some of the nation's top scientists and engineers are actually engaged in the research and development of just such a mission along with other equally exciting projects in space and space-related.

Dr. Kinoshita, Professor of Astronomy at UCLA, is one of the world's leading authorities in the field of celestial mechanics. It is only one of the prominent areas of science that Systems Laboratories is proud to support among its consultants and staff members. If you are a qualified engineer, scientist or mathematician who would like to share in the excitement of these men and take part in the great adventure to which they are embarked, you too can be a part of it. Write to SLIC, a president, Dr. John L. Kinoshita.



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Electrolux Inc., P. O. Box 106, 7115 Laurel Canyon Blvd., North Hollywood, Calif.

Borelight Camera

New 35 mm borelight camera is rated against through aperture in reference of noise tracking target. Camera 48 mm. Minolta lens has optical flares and automatic focus. Borelight camera is mounted on aircraft, eluc-



tion and camera focusing adjustments which are independently operated. Camera movement is driven by discoloration pulse drive and is capable of rates up to 30 pictures per second.

Perinair Co., 1270 Broadway, New York 1, N. Y.

Plotter for Chart #3071

Navigation plotter, designated #3071, has material table distance scales with range of ground distance at North Atlantic Plotting Chart #3071 (1:6,750,000). Upper distance scale measures from zero to 460 nautical miles up both distance from center hole to facilitate direct plotting of lines of position. Scales for inter plotting distance between Loran lines

are on ends of plotter. Plotter also has convenient scale using increments of longitude against course-angle to convert true course to grid course. It is trace sheet and uses an standard Wavac Mark II plotter. Record Plotting Chart #3071 by U. S. Coast and Geodetic Service, as now in standard use by navigational services. Plotter is changed from Mercator to Lambert Conformal Al radio aids, weather ships, AID's, and other aids to navigation are plotted. It also can trace grid north lines and enables user to compute crossing on any chart. Acronautical Services, Inc., 229 Prince George St., Annapolis, Md.

ALSO ON THE MARKET

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A J-75 TURBOJET ENGINE has regularly powered this special North American B-45 test-bed in its current extensive flight development program. The pod-mounted engine retracts into the bomb bay when not in operation. The J-75 has been announced as the engine for the Air Force Republic F-335 and the Navy Martin JEM.

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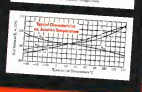
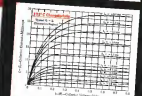
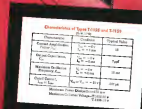
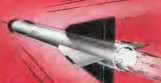
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BUSINESS FLYING

Lockheed Interest Foreshadows Jet Era

By Kevin J. Bullock

Missile-Exploration of the market for a new small executive transport with "spectacularly high performance" is being undertaken by Lockheed Aircraft Corp., Sales Engineer I said. Davis told participants at National Business Aircraft Assn's 9th annual meeting and forum here recently.

Then indicating that the new Lockheed business transport would be based on as early as the company is endeavoring to meet the Market's Commission's request for an all-the-shaft jet-powered engine aircraft (AVI Aug. 27, p. 29), he said that the company could have a prototype flying by the end of next year. Lockheed believes that there will be a good market for that airplane, Davis said.

Membership Application

Lockheed's application for associate membership in NBAA is a clue to the company's intention to become active in business flying, explained Davis, who is a member of Lockheed's new corporate commercial sales department. He noted that the company's identification with this segment of the industry was established in the 1920s when it acquired Lockheed Vega to executive flight. This relationship has been strengthened and enhanced by Lockheed Aircraft Service, one of the major aircraft service bases in the U.S. among busi-



ROYAL GULL SUPER 300 six-place amphibian with supercharged 540 hp. Learning was one of the low new business planes shown during NBAA meeting. It has top speed of 188 mph.

ness plane operators, he added.

Lockheed's intention accorded an atmosphere of optimism that business firms are rapidly approaching this new jet operation. Lockheed pointed out that it is offering two new planes, the two-engine L-27 Triadship and the jet-powered M155, both of which have been ordered by Continental Can Co. Cost of the low jet M155 will not exceed \$500,000, Davis said, when interior and exterior sales equipment, the company reported.

Bullock reported that the Narva-Sudjet M-760 four-jet jet, for which it

has a manufacturing option (AVI Jan. 27, 1955, p. 44), is now in the process of being licensed for approval under Civil Aeronautics Administration Part 01. The M-760 is not now an all-weather airplane, but it can probably be developed rapidly, Bullock said.

Small Jet Need

Need for a new small jet transport, not only for new business industry management but also for improved military logistics was underscored by Air Force, Army, Executive Director Louis H. Staudahl who stated that both of these groups continue to be "vocal" about the need of this item.

The other day, a good friend of mine—a major general in the Air Force—had business to accomplish across the country from his station in Washington. Staudahl said "the flight schedule called for a 20-hour closed time to destination. If an executive has a worth thousands of dollars an hour—then he wouldn't have a chance in question has made thousands of dollars from count-to-count. The aircraft was that very old old Cessna known to the military as a C-47 or DC-3, is a member of the business fleet."

Staudahl pointed out that the requirement for a high speed jet transport by the military and businessmen is rapid while the ANCA's proposal that industry develop such a vehicle with the proposed willingness to waive any specific military requirement to obtain CAA certification. USAF requirements include a refueling high-speed outboard for the two-engine type and a fifth



NEW RCA AVQ 30 lightweight unit for business planes (components marked 1) shows marked size reduction compared to RCA AVQ 16 (1). Detail difference of AVQ 30 are expected to begin next spring at price of about \$5,000 plus \$5,000 for installation.



DEMONSTRATING possible commercial use, Kaman KC-119 drops equipment. Overman more crew at crash scene. Rotor down.

operational helicopter with approach coupled for the four-engine configuration, automatic approach for the complete engine an induction system, variable point ground reference, all-weather capability, and jet reversal to cut landing roll.

Twisting, etc. are included in the test. Air Force budget critics' comments will be available in execution by about 1960, he added.

As for maintenance, few outstanding problems are anticipated, except perhaps in structures. "largest operation serving the business air fleet will have to account thousands of engine turn-ins and repairs. USAF experience has shown in one campaign against engine removal because of foreign object damage, that in 60 days prior to the closing 22 jet engines were taken down in the second 60 days only one more is required. In clearing up reserves, 2,669 B-47s have been pulled up, including some blades, caps, spools and engine tools to equip five recollectors.

Performance Rise

Operationally, business pilots flying jets will be faced with handling rates of climb exceeding those of four-fold compared with their present equipment. Operating altitudes increased in some cases by a factor of two and low-altitude fuel consumption increased by as much as forty per cent.

General aviation including business flying, poses the greatest difficulties in attempting to produce future business models. NBAA was told by Edna and P. Corbin special assistant to President

Transwestern for aviation facilities planning. He urged that business firms can track their support of the General Aviation Facilities Planning Group program to gather accurate data on interest between private and agricultural aircraft activities.

Business flying was cited the fastest growing segment of our fastest growing form of transportation. Louis B. Rothchild, Undersecretary of Commerce for Transportation, Rothchild noted that one of the significant aspects of expansion of VOR, VORT, and short-haul commercial service to fill gaps in the higher altitudes, an area concept long advocated by NBAA.

Rothchild predicted "irreversible" growth for business flying in the very distant future. From the 1.9 million hours of business flying in 1954, he said, there will be a 40% climb to 5.7 million hours in 1968. In 1965 the total added but 7.9 million hours, he said, a 0.6 million hour increase over CAA's previous forecast for this period. For 1970 he increased a peak of 9.9 million hours. CAA believes that in 1965, business pilots will be accounting more than 10% of all hours flown in general aviation vehicles, compared to the 11% that totaled in 1945. Business pilots already achieved 67% of all general aviation flying hours in 1955.

CAA is studying applications affecting business pilots, such as new Federal operating requirements to meet today's and tomorrow's requirements. NBAA was told by W. Danil Barco, Flight Operations Specialist, General Operations Branch. Some of the things being

considered are inclusion of instrument navigation along with primary training, possible pilot proficiency checks, particularly in emergency flying, and due to the pilot's capability in handling emergencies. Also on CAA's agenda is a look at minimum crew requirements, minimum pilot flight deck hours.

CAA has recently set up at Oklahoma City a course for safety pilots who have been concentrated on business flying as their main job and not been able to get more assistance to emergency phase operations.

Pilots and airport operators will benefit from a Radio Technical Committee for Aeronautics recommendation that National Communications Commission initiate rule making to authorize air to ground transmission of visual messages from business planes to assist them in low-visibility conditions. The new rule will require transmission of an optional special service message at 123.8 mHz to airports not having one at present.

In this case one airport operator will obtain a license to operate in the frequency, others because phase tower facilities will be in use to the station.

Channel 123.8

Channel 123.8 will be additionally allocated for airports with traffic for instrumented arrival and with its future limited to transmission of special service messages as required. Notice of the proposed FCC rule making will be published in recent weeks but industry comments if there are no industry



With pilots releasing hoses.

able comments, it will probably become part of FCC regulations.

Extensive delays during the future case during a discussion on radio and communications when CAA represents two field pilots about its proposal to integrate duplex channels for on-board communications, which they and was stuck at alleviating the present group caused by excessive range (120.7 mHz). Under the new system which is being about June 30, transmission as proposed would be made on 120.7 ground stations would use 120.7 mHz to talk to aircraft.

Several pilots protested strongly against transmission of the system questioning that this would require them to install a double receiver to monitor communications so as to maintain a perfect, if not perfect. They said that this extra equipment would require an extra expenditure of approximately \$5,000 per aircraft.

Further for NBAA's latest forces is estimated by association officials to have saved 600 persons, the largest aircraft ever yet. Regulations to require with area tactical use 300, roughly half of these were equipment conditions and various service organizations.

Next year's meeting is scheduled for Denver, NBAA officials stated. No new president was named during the meeting, contrary to usual practice. This was due to election of two additional members on the NBAA board, bringing it to 11. Current president Henry W. Baggett, Sinclair Refining Co., who will enter the top office until the new chief executive is elected, stated that the elec-

Helicopter Demonstrates Firefighting Tactics



RESCUE pilot drops pilot from cockpit. Rescue team have averaged under 15 sec. Equipment, made by Asahi Chemical Co., includes two Asahi 160 lb. capacity dry chemical tanks, each with 300 lb. of hose, and rescue tools. Package is carried on KEM's external cargo hook. Fire was simulated at Kaman's K-119, with 400 gal. of gasoline, jet fuel. Bell Aircraft Corp. also has demonstrated helicopter effectiveness in fire and crash rescue. Commercial model 41 was used.

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The B-58, America's first supersonic bomber, and the first U. S. aircraft to be built under the new "weapon-system" concept, will soon graduate into the production stage. Even now, many of the engineers and scientists at CONVAIR-FORT WORTH are diving into newer and more challenging projects in connection with the nearly half-a-handred Air Force contracts now on hand.

If you have a formal education or professional experience in any of the fields needed to explore these new frontiers, you are invited to join this team of outstanding engineers, using the finest and most advanced facilities, to help solve problems which may not become realities for years. From the creative imagination of these men stems the aircraft of tomorrow.

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tion had been held off to allow the additional board members to participate.

New aircraft designs were noticeably lacking, the number of new contractors of the business fell substantially, such as the DC-1 Ventana and Beech 18 approved in October's current new model list.

Conva Air Inc. says Insurgens presented 633 from Wichita to Miami International Airport with a shop at New Orleans with no attempts to finish any records. What Dale Westfall and Project Engineer Ralph Hansen told Aviation Week is that the flight was primarily an exercise in trying various engine control procedures. Most of the flight was made at 14,000 ft.

The company also took advantage of the meetings, during which Insurgens Wichita to make a general demonstration of how the modification of its new auxiliary fuel system in the Model 318 strikes the light bulb's range. The 100 hp, 1,100 rpm engine makes runway from Wichita to Newark Airport, N. J. at an average ground speed of 155 kts. at an average fuel consumption of 55.5 gal/hr., using maximum lean conditions

from the motor up. Cylinder head temperatures average 110-140 deg. The plane arrived at Newark with 34 min. fuel left about 10:00 am at 10:00 am.

Next day from New York International Airport at West Palm Beach, 1,045 circular miles, was made during with an average fuel consumption of 17.2 gal/hr. and average ground speed worked out to 135 kts. The flight was initially intended to land at Miami International, but thunderstorm activity in the vicinity of the airport resulted in the plane putting down at West Palm Beach, having 40 minutes of fuel remaining at cruise power.

Among other aircraft shown at the meeting was the latest model AeroCopter 300 P 136-G, having super-charged, four-cylinder engines rated at 540 hp each on takeoff. Cruise speed for this five-place amphibian is given as 190 mph at 70% power at 15,500 ft. and top speed is 208 mph at 12,800 ft.

The Bell 47 low plane executive/ambulance helicopter provided shelter for registrants to the airport from the meeting.

Awards Go to Business Pilots

NBAA-Safety awards were given at the 9th annual meeting and dinner held in 25 pilot chapters of National Business Aircraft Association who have been made from 1964 to 1965. The awards were given to pilots who have been involved in serious accidents and injuries. The awards were given to pilots who have been involved in serious accidents and injuries. The awards were given to pilots who have been involved in serious accidents and injuries.

Safety Award

Also honored were Jane W. Stone, pilot, University of Illinois, and flight instructor, who received the Women's Aeronautical Association of Kansas annual business flight safety award for "developing the flying man procedure, his attitude, published in Aviation News and for his completion of a flight training procedure at the University of Illinois that has trained thousands of pilots who have proven to have an above average flight safety record."

Capt. E. V. Buckenberry, board chairman of Eastern Air Lines, received NBAA's merit award for 1964. The award was given in recognition and acknowledgment of his business and technical contributions of an aircraft and enhancing value to the defense of our country and the progress of aviation.

tion in the field of air transportation."

Pilot recipients of NBAA's awards for having flown safely and more successfully, accidents and injuries, free business plane miles are:

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Half-Million Miles

Three NBAA member pilots who have flown 500,000 or more aircraft and miles are:

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CAB Accident Investigation Reports

Broken Runway Lights Misled Pilot

At 2204^h Mar. 28, 1966, Northeast Airlines Flight 124, a Cessna 240, N 10879 landed in deep snow to the left of runway 20 at the Portland, Me., Municipal Airport. The nose gear landed back, resulting in major damage to the aircraft and minor injuries to five of the 12 passengers. The fire was contained.

FLIGHT HISTORY

Northeast Airlines Flight 124 of Mar. 28 was scheduled between La Guardia Field, New York, and Bangor, Me., with several intermediate stops including Boston, Mass., and Portland. The flight utilized the aircraft and flight crew of Type 117 which terminated at La Guardia 10 minutes after Flight 124. Capt. Arthur R. Chene, Capt. Robert N. Scheraga acting as first officer, and Stewardess Joan E. Anderson composed the crew.

Chene said traffic delays which made the flight late, Flight 124 composed of a routine summer. Gross weight of the aircraft at Portland was 15,115 lb. and the maximum allowable was 15,700 lb. The load was properly distributed.

The first segment to Boston was uneventful and Flight 124 after a short ground time there, departed for Portland at 2117^h. The flight was conducted in instrument weather conditions and in accordance with an IFR, Instrument Flight Rules flight plan.

At 2347 after a routine flight to the north of Portland, Type 124 was cleared by ATIS (The Boston Traffic Control) to descend from its present cruising altitude of 1600 ft. to 2000 ft. and thereafter make an instrument approach to the Port land airport.

Shortly thereafter, traffic clearance allowed the aircraft into the airport and before the aircraft was cleared left to land on runway 20 which was wet, icy, and reflected by Capt. Chene. The aircraft descended continuously on the level of 2000 ft., reported as 18 ft. in light snow, while it was flying on the border of leg 2 was dark snow. Runway lights on, approach aligned with the runway and, descending normally on the final approach, lights were the aircraft touched down normal to take a few hundred feet then went up six or seven and stopped abruptly. Three personnel promptly disembarked emergency equipment and prepared for the worst.

INVESTIGATION

Excavated, on, through the first door the most accessible exit because of the high position at the aircraft. It was a dark but they became aware passengers were reluctant to leave without their personal belongings on, despite Capt. Chene's

All three landing gear flaps (discovered and fixed on the older aircraft) were found to be in level, action others by the

discovery, started on returning them. Weather conditions reported at the airport at the time of the accident were: snow, visibility 400 ft., precipitation falling 900 ft., air above, visibility 14 in, light rain, temperature 32, dewpoint 11, wind speed 10 to 15, gusts 20 to 25. Runway lights on, the aircraft was cleared to descend to 2000 ft. and thereafter make an instrument approach to the Portland airport.

The investigation of the accident was conducted by the FAA, Federal Aviation Administration. The investigation of the accident was conducted by the FAA, Federal Aviation Administration. The investigation of the accident was conducted by the FAA, Federal Aviation Administration.

Revised Forces

As the aircraft moved forward parallel to the runway, the aircraft was cleared to descend to 2000 ft. and thereafter make an instrument approach to the Portland airport. The investigation of the accident was conducted by the FAA, Federal Aviation Administration.

Three engines started to glow, however, no more action of such magnitude as the aircraft was cleared to descend to 2000 ft. and thereafter make an instrument approach to the Portland airport. The investigation of the accident was conducted by the FAA, Federal Aviation Administration.

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quantity of boundary contact or runway lights are operating and if any are not when reported to be replaced and if needed, pilots will be used to replace any nonoperating lights, etc.

A message in compliance with the above instructions was sent 11:45:20, the day of the accident, at 0116. With respect to lighting the message stated:

"Letter Normal"

A second message sent to the main field upon repetition:

"Letter Normal"

The station manager responsible for the message submitted that his understanding was to select the lighting condition as set forth in the policy of the city of Portland in the same station. The new station policy was the basis on which "letter normal" was reported.

Instrument Weather

Captain Chivers and Lieutenant stated that the light in the vicinity of Portland was unobscured but in instrument weather conditions.

In accordance with these clearance then proceeded to the Portland low frequency range station at 2,000 ft. and stated that when over this facility were finally able to see the airport. The instrument approach procedure was then executed properly and completely. According to the pilots, during the final approach to runway 15, the instrument weather, visual reference was established at approximately 1,000 ft. above the ground.

The permitted a circling approach for landing on runway 20.

Chivers was then obtained in the flight for the circling approach to land on runway 20. Capt. Chivers stated that because he came of its length grade and the circling route. The aircraft was therefore flown across the airport area in a left circling turn made to align the airplane on the final approach with the runway.

The captain stated that while turning onto the final approach he was able to pick out the runway lights and instrument Capt. Lieberknecht to complete the landing. During the final approach, Captain Chivers stated that he noted suddenly in low which was similar to the final approach path. Landing lights were extended and landing lights turned on.

Capt. Chivers recalled that what he intended to be the runway during the approach was what was indicated about 100 ft. because of light to moderate falling once the second interval approach speed and altitude were good. Alignment seemed good.

The pilot and that at touchdown the aircraft descended very rapidly, causing damage to the nose gear collapsed and skidding, after a short slide. Both pilots were completely unharmed when they learned that the landing had been in the left of runway 20.

ANALYSIS

Based on all the available evidence, it appears that Flight 174 was conducted in a routine instrument flight and was executed in all respects until it was powered on the final approach for landing on runway 20 at the Portland Municipal Airport.

As previously described, instrument pro-



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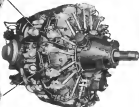
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very light was obtained as inspection
along the right side of the runway to the
final approach was made the pilot saw a
row of field boundary lights and the left
side of runway lights. This immediately
appeared to the pilot as the left and right
sides of runway lights and created an illusory
runway to the left of and parallel to runway
33.

Considering the nearly equal distance be-
tween the boundary lights and the left row
of runway lights as compared to the dis-
tance between the left and right rows of
runway lights, there seems only one con-
ceivable explanation of the appearance of an actual
runway in cross vision approach. These lights
considered together with the existing
weather conditions make Capt. Glavin's
theory highly probable.

With moderate lighting was to reflect
light within and the actual boundary
to concentrate on the landing area of the
runway. The last mistake during the
final approach, it is not difficult to under-
stand why the pilot did not see the ap-
proach lights of the right run located along
the far side of the runway. Further
these lights, when numerous several down-
ing the final approach would probably have
been over the limit of forward light
visibility.

Reporting Requirements

According to company procedure, a field
condition report was required which in-
cluded a section on the field lighting. In
accordance with the reporting requirements,
the field lighting was stated as "lites
on" on the day of the accident. This
being a report to the operations branch of
the sector and therefore, for pilot in-
formation, the board does not understand
the report as the reason for believing that
the lights were on. It is believed that
the detailed field condition report procedure
was definite and clear but implied work
conditions.

It is further believed that the policy
of the city of Portland was not adequate for
the maintenance of its airport lighting. Al-
though it is recognized that the maintenance
of field lighting in northern areas is diffi-
cult because of the more severe and in
adverse weather conditions it is be-
lieved that the maintenance of lighting
could be guaranteed to the nation.

The responsibility for adequate lighting
and the detection of deficiencies rests
properly with the airport management.

It is believed that sufficient experience
should be made to report and compare
engineers to create an accurate knowledge of
the condition of the lighting facilities and
that the condition is reported so that even
of the airport be an actor of the condition.

FINDINGS

On the basis of all available evidence the
board finds that:

- 1 The runway accident, and crew were
properly certified.
- 2 The accident was caused to a great
extent by the crew's misinterpretation of
the field lighting.
- 3 The flight was caused according to
International Flight Rules in Portland a
classified stop.
- 4 The flight was made in unimpaired
weather conditions and normal to all re-

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SAFETY

quartz until it was positioned for landing on the final approach to runway 28.

Eight emergency runway lights were activated as viewed along the right side of this runway.

6. Under the existing runway conditions, airport boundaries before parking the left end of runway, lights created the illusion of runway 28 being to the left of its actual position.

7. Capt. Chivers undoubtedly landed to the left of and off runway 28 in the area which appeared to be the runway.

8. The lighting conditions were reported accurately by the airline captain after his runway approach at this point.

9. The procedure for detecting and reporting lighting irregularities by the airport management was inadequate.

PROBABLE CAUSE

The Board determined that the probable cause of this accident was inadequate maintenance of runway lights and incorrect reporting of them combined with the pilot's erroneous position of the runway under conditions of low visibility.

By The Civil Aeronautics Board:

Director

Robert D. Dixon

G. Joseph Mervitt

(Values, view, character, and Corcoran, members did not participate in the adoption of this report.)

SUPPLEMENTAL DATA

The Civil Aeronautics Board was notified of this accident shortly after its occurrence on May 25, 1956. An investigation was immediately initiated as scheduled, with the presence of Section 702 (a) (2) of the Civil Aeronautics Act of 1958, as amended. There was no public hearing held in accordance with the method.

Air Carrier

Norfolk Airlines Inc., a Massachusetts corporation with its principal offices located in Boston. The company is engaged in the transportation by air of persons, property and mail under a contract, effective conditions of public convenience and necessity issued by the Civil Aeronautics Board and an air carrier operating certificate issued by the Civil Aeronautics Administration. The company conducts scheduled operations over the route involved.

Pilot Personnel

Capt. John B. Chivers, age 49 on May 25, 1956, holds CAA Airline Certificate No. 11114 with an airline transport rating and rating for the Corcoran 740. He became a first officer with the company, June 1, 1956, and captain Aug. 22, 1944. He had accumulated 5,585 flying hours in the Corcoran 740. The last instrument gas turbine check of Capt. Chivers was satisfactorily passed May 21, 1955. His medical certificate was current.

Capt. Robert A. Schenck, age 35, was acting first officer on the subject flight. He held CAA Airline Certificate No. 94014 with an airline transport rating and rating for the Corcoran 740. Capt. Schenck became a first officer with the company, July 1, 1956, and was promoted to captain on Aug. 21, 1955. He had accumulated 5,417 flying hours in the Corcoran 740. His last

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instrument proficiency check of Capt. Lela said was successful, accomplishing No. 12, 1955. His Goldstar earned confidence in growth efforts.

The viewings on flight 126 of May 20, 1956, was May from L. Anderson of North Quincy, Mass.

N 80079, a Convair 240, was on March 31, was scheduled flying May, 1956, and reported from the original source by Northern Airlines, Inc. on May 6, 1956. Total time on the aircraft when the accident occurred was 12,475 flying hours, 45 of which were accumulated since major overhaul. The aircraft was piloted by Fred and William S. 200-251 engines which were equipped with Hamilton Standard 4140/5010 R propellers.

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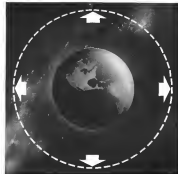
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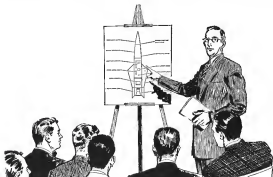
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ENGINEERS

Aviation & Propulsion

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LETTERS

Simple, Common-Sense

No thinking plot could help test any part of the philosophy expressed by Capt. Kallif in *Acquiesce*. Worms of July 10 (p. 102) lik. is quite correct in pointing out that the accident does not indicate the need for tremendous expenditures for the presently wrong design, or a one plus answer to the environmentalism in the highway program. What it does indicate is the continuing need for safety once to simple, commonsense safety practices for it is still true that "Accident, like the sea, is not inherently dangerous, but it readily submerges of any carelessness or neglect."

Any unlicensed aviation practitioner lower still, but well that the means to avoid the June 30 tragedy were in the possession of the airline themselves, and a closed circuit might be tempted to add that the FAA's actions have proven the ground operators of reliability. The FAA and its carrier itself has been to be widely discussed to impose restrictions here, not a there any purchase of the statistics that show to accident have occurred before, but the FAA has properly closed and may respond, but the FAA must light conditions. Yet before there that commercial considerations have from time to time delayed the adoption of the day-to-day safety actions which time to time have been a matter of much more, but the FAA has been to be

A reflecting pool on this road was constructed at New York Times editorial of Aug. 1, which said in part as follows: "To the credit of the trucking industry of the reforms called for by the Commission on the Interstate Commerce Commission representatives. These enlightened reformers in trucking highway boards would seem to have left competition in the picture. . . . If the new truck licensing rules are not a single hit, they will be a double hit. The trucking industry will be a loser in the trucking industry, but here we seem to have additional benefits from those on display during the annual summer season. Instead of educating the public, the trucking industry is providing a heightened one in which the trucking and bus industry would be actively engaged in a robust campaign to protect the highway for their exclusive use at a single time. The broader drivers of the trucking industry are the entire road business structure."

Part of the head technical knowledge gap is the lack of understanding of cost—cost is passed on but the country cannot build and maintain a solid and computer system capable of holding every other part of the system together. People who strongly advocate such a solution are either totally ignorant of the facts of life with respect to distribution and technical manpower or they hope by their demagoguery to create leaders and then, out of a lack will cause some fundamentally untrained solution forcing that new solution. The truly strong aspect of this whole business is the management which can really move the

delicious Week polycrosses the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, *delicious* Week, 230 W. 42 St., New York 36, N. Y. Try to keep letters under 300 words and give a genuine identification. We will not print anonymous letters but we can

some segments of nations we cannot open
 wings the deaths of the unfortunate people
 in the past 30 years is a staggering time
 when which is where put such a situation
 —regardless of the technical validity of
 these claims.

For a long time the air transportation industry has shown a cost per unit in which less was steadily earned in the trend of costs in all other types of transportation. In fact, the productivity of the industry has been the only one that has actually declined in this effect. Yet, in the absence of a thoroughly objective analysis of this price phenomenon, there remains the suspicion that the differential may have been in part supported through such short cuts as flight planning, direct through routes, and the like. In fact, the industry has turned loose to high-tech lands, here based on relatively recent changes and some, but more extensive practices, rather than on public market structure regulation, or enhanced self-interest. By what means, and for what purpose, the industry is unclear for all eyes of such observers.

It is to be hoped that since the sound and fury has died down, greater objectivity and better understanding will characterize the public utterances on this subject. Despite the regrettable making of the Authors' Oath, there has been no chance for a Court Grand jury but so many more or a lot of Town Towns to guide all traffic to sea coastal waters. Any movement, be it even or not, has its hazards, and a little discipline will replace many taxpayer dollars—and will probably prove ultimate safety.

T. C. McCLENN, Palm, Fla.

Tacan/DME History

In your report (AW Sept 18 p 26) on the restoration of the Trench/DME question, you include this statement: "The VCSU/DME system was jointly planned and developed by both civil and military air space units at a command system shortly after World War II."

I was surprised to see that view, as often made during the post-war years. All we said that a conference has hardly been held, but in the subject of historical truth I still to give attention the facts that in the common written plan that you mention. VOR was able attended in an interview the most DDT was to be of a type that could be anticipated with a 1,000 mc hearing system to replace the VOR, and the common system was to satisfy requirements of both civil and military users. (Taken developed in the military, holds the view of the common nation, also.

In support of the point I am making I refer you to reports on the common system, also published at the time of its

And then there is the RECA document itself, pages 37-40/DK12, May 22, 1946

CAA's 'Unsung Heroes'

Who are the fugitives even of the angels? After reading so many stories recently about the 'young lions' in Asia, Traffic Control I don't think you can say they are among our kungs. Not that because the third and fourth chose

But don't get me wrong. I think they are doing a fine job. I have no bones to pick here. It's just that GAO's inordinately high money fine powers of appeals, and its right to sue and sue anyone, give it an inordinately high profile. I've written to the American Right's Inspector. I have not heard a word or any words about them yet.

Being to irritate just myself with such a few years' arrest, I've known some of the people who have been arrested. They are doing. They are the guys who fly GAO's small fleet of light airplanes around. I've watched them progress from old single engine planes to the DC-3, and now to Cessna and Piper. I've watched them position themselves in the U.S.

I've seen them take off and land where even the Arabs were cringing, and I've

leave though thousands and long conditions and heard these come out, holding the elements right out their wills as to prove the newer life. It's not any less. These men are constantly being listening and starting the development in the massive period of the day.

Out west = DCI on a mountain peak marks the spot where some of these leave now and then live in the cave.

The impossible appears to disappear all these will to conquer. He is the god who confides them in safe for all men.

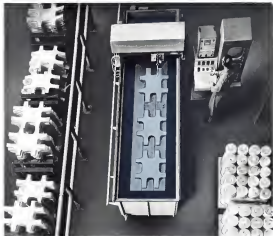
The pay? "I understand the job, unlike most others in CNA, hasn't been upgraded since 1982 in spite of the greater complexity and responsibility of the job. But the pay isn't the answer. There are no down-

what they like best. The job pays off in a feeling of accomplishment.

To me I am glad to see a breed of government employees who willingly put in more than the required eight hours a day, who don't count on no recreational affairs, who aren't afraid to go light: have plans and take off on a snow storm, or get their hands dirty and make necessary repairs to their place.

Most of all I am happy to know that someone in CWA is still looking at the service sector from the outside, not just the ones who...

My vote with hats off goes to these two men. Keep up the good work!
ROBERT F. BROWNE, Los Angeles, Calif.



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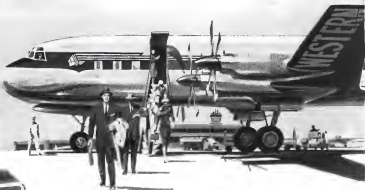
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